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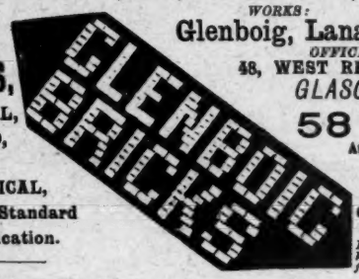

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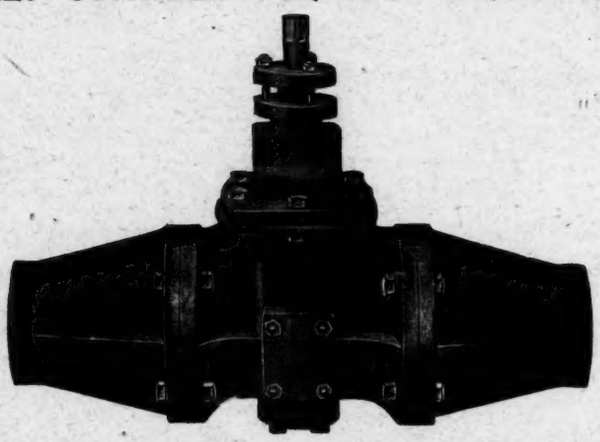

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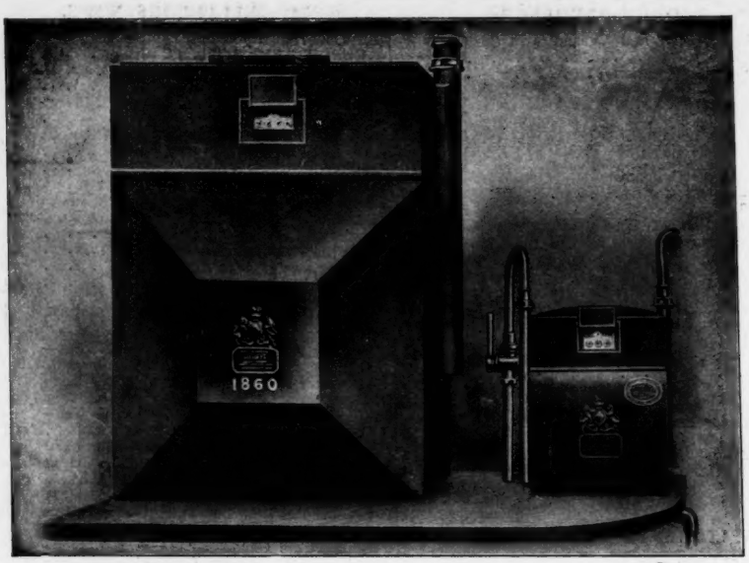

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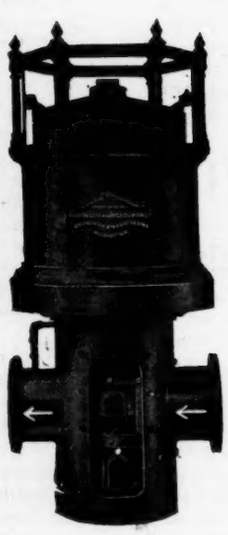

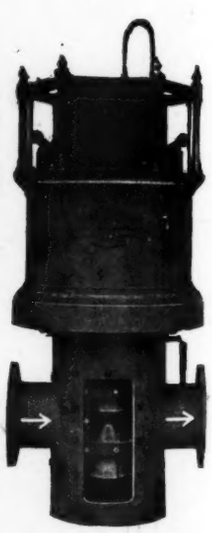

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EDITORIAL NOTES.

Coal Position—Gas Standards and Rationing.

THE statement which the President of the Board of Trade (Sir Auckland Geddes) made in the House of Commons last Wednesday, and the memorandum which the Coal Controller (Sir Evan Jones) submitted to the Coal Commission the same day, will not raise enthusiasm throughout the country favourable to tne coal miners. These are the real controllers of coal output; Sir Evan Jones the Controller of the coal that they choose to raise. The men are not working as they used to do, and as they should do; and the result is that the output has declined considerably even before the shortened working day (which commences July 16) comes into operation. The position can be put into a nutshell: The average number of men employed during the first twenty weeks of this year was 1,111,000, which is exactly the same number as the average employed in 1913. But, during the first twenty weeks this year, the output was at the rate of 242 million tons, as compared with 287 millions in 1913—an average falling-off of nearly 16 p.ct. This is really a very serious drop; and yet there are the same number of men employed as in the year of maximum output. Serious as this is, it is not all. It is estimated that the reduction of working time will produce a further decline to between 214 and 217 million tons in the ensuing twelve months—a fall of about 70 million tons compared with 1913. This is a very grave position, which is aggravated by the fact that the already reduced exports will have to be further cut-down in order to preserve for home and bunker use a quantity having an equality with 1918, which was the year of fuel and lighting rationing, and of constant appeal to all and sundry to economize to the utmost extent. In 1913, some 210 million tons of coal were available for inland use and bunkers; the export that year reaching the peak of 77 million tons. Last year, on the other hand, the available coal for inland and bunker purposes amounted to 196 million tons; and the exports were curtailed to 34 millions. This figure will, according to the reckoning, have to be brought down to 23 million tons—a loss in the export trade of 11 million tons, compared with last year, and of 54 million tons compared with 1913. We doubt whether the reduction to 23 millions will suffice in the circumstances. The concessions to the miners, combined with their own unwillingness to maintain production, are going to be costly matters for the country, both directly and indirectly.

The position shows clearly that the restrictions which were operative last year will have to be continued any way during the next twelve months. The President of the Board of Trade recognizes this; and, this being so, it may be anticipated with a fair amount of confidence that, in order to save coal, without considering any of the other advantages to the gas industry and its customers, there will be no reimposition of the old gas standards. If this is so during the next twelve months, then there is quite the chance, providing the work is prosecuted with earnestness, that by then legislation may have been passed to give effect to at any rate the main features of the report of the Board of Fuel Research, with modification of those details which propose unnecessary refinements not making for economy. The Board of Trade are moving in the matter of taking action upon the report; and they have already convened, for the 16th inst., a conference of representatives of those interested to discuss the preliminaries.

At best, it looks very much as though the experiences of last year are going to be largely repeated this year, except that there ought to be an easing of the position this year on the Continent, and transport at home should find relief from the return from their wanderings abroad of locomotives and railway wagons. Touching transport, it is satisfactory to learn that the new Coal Controller hopes to be able to modify to some extent the present coal transport organization with a view to giving it greater elasticity. We trust that one effect of this will be to ensure that suitable coal for gas-manufacturing purposes will find its way to gas-works, and not, as has been the case through the transport scheme for the saving of ton-miles, to domestic grates. This strange proceeding imposed a heavy uneconomy upon the country as a set-off to any ton-mile saving. Another modification which the Coal Controller hopes to introduce affects rationing. Consumers of less than 5 tons of coal per annum, 12,500 c.ft. of gas per quarter, and 400 units of electricity per quarter will be exempt from rationing, for which relief they will be truly thankful. But above these limits the assessments already made will continue in force from July 1. The prevailing assessment for gas is 18,750 c.ft. as the equivalent per ton, and for electricity the absurd allowance of 1000 units—these figures including increases of 25 p.ct. on preceding allowances.

But the most serious thing for the country is that it is estimated that the working under the new conditions of the coal industry during the year commencing in July will result in a deficit of £46,600,000, which is equal to 4s. 3d. per ton. Who is going to find this—the coal consumers or the taxpayer? If the consumers, then the price of gas will have to advance again, and that substantially. Anyway, we may finally quench all hope of the price of coal coming down at the pit head; it is more likely to ascend somewhat seriously. Altogether in respect of its coal supply, the country is in a very unhealthy and precarious position.

Nationalization and the Subversion of Private Enterprise.

"ONCE you infringe fundamental justice, and set a bad "example, it is very catching. If the coal industry is made "the victim of such treatment, how long will it be before "other industries experience the same thing?" These are words employed and a question put by Mr. A. Mitchell-Innes, the Chairman of the Consolidated Cambrian, Ltd—an important Welsh colliery combination—in a speech he recently delivered to the shareholders, at a meeting at which they passed a resolution emphatically protesting against the proposals of the Government to penalize the coal trade as compared with other industries in the country. Both words and question should generally arrest attention; for underlying them are truth and gravity for this very critical time for the industries of this country. Few investors appear to realize how critical the time is. Large users of coal, and with an enormous sum of invested capital at home and abroad, the British gas industry cannot help looking at the question from the two points of view of coal and capital.

Dealing first with the general aspects of the matter. The ball has now been set rolling towards nationalization; and it seems to have very quickly gained great momentum—simply owing to an evasion of fundamental principles by the advocates, and a much too generous assessment of the valuable effects that will accrue to labour from nationalization, while the possibility of any bad effects, which would altogether overbalance the good, has already been completely buried in oblivion. The singular thing about these schemes of nationalization is that they have emanated almost exclusively from the extreme labour representatives, backed by a few enthusiastic political theorists. The

investors of capital and the consumers of production or the users of public services have made no claim whatever for any such action on the part of the Government. In fact, so far as one can gauge the feeling of the country, investors, industries, and consumers generally are totally opposed to any such change of policy; and the major part of labour would be so, too, if it only knew whence it was being led, and was not the mere puppet of a few extremists whose theories are of a peculiarly hollow kind, and cased only by those platitudes that are so much favoured by street-corner demagogues. While labour (speaking broadly) has a perfect right to its views, labour is only a section of the community; and, nationalization being essentially a national question, the country will not be prepared to accept labour as its sole mentor on this matter, nor its self-seeking philosophy as being comprehensive of all considerations. But, curiously enough, the Government appear to be showing a little bias on the side of advanced labour. We say "advanced labour," because we do not believe that with the majority of workers this particular question has had any depth of consideration, nor do they care much about it—more the pity. If there was this care, the view would soon obtain strong hold that the question is a double-sided one, and that nationalization would tend to the destruction rather than to the promotion of the interests of labour.

There has been a battle royal before the Coal Commission on the subject—a battle between brains and a small handful of stubborn theorists, who are incapable of making proper judgment because they would sooner sacrifice commonsense than the theories that they have formed, and are pledged to support. Men of great capacity and discrimination have been before the Commission, and have given one after the other sound reasons for a conscientious belief that the material prosperity of the country and its people would suffer from the nationalization of industries—the coal mines among the rest. They have looked at the question from many points of view—those members of the Commission who already favoured nationalization before hearing the evidence, and obstinately adhere to their preconceptions, only consider it from the one point of view of the betterment of the conditions of the miners, which conditions are surely not the only things that count. It is not only in connection with the coal mines that the matter is being discussed. The Ways and Communications Scheme is steeped in nationalization. Railway, canals, docks, coastwise transport, and road transport among other things are rolled-up in the one project. Who urged the Government to take up these matters? Only the trade unions, or rather some of their communistic leaders. We do not believe for one moment that the Government would have entered upon these questions at the present time, had it not been for the trade unions. They have provided the incentive and the goad. The State is stronger than all the trade unions put together; but the Government apparently do not like the power for harm of the Triple Alliance—the miners, the railway, and the transport workers—nor the outlook which embraces the possibility of the textile unions coming into line, and adding their might in attempting to force their own political policy, though the parliamentary trade union party are wisely adverse to the unions being made the vehicles for interference in political policy which falls to the duty of the elected representatives of the community generally, and not to any one particular section. Then, again, there is the proposed central control—which amounts to nationalization—of electricity generation. There may be a good deal of machinery between Westminster and the generating stations, in the way of Electricity Commissioners and their staff, and the District Boards and their staffs. But the fact remains that, if the scheme is endorsed by Parliament, the Boards will be subject to the control of the Electricity Commissioners, and these in turn by a Government Department, which in turn will be subject finally to the decisions of Parliament. Electricity generation being removed from all control by companies and local authorities, the result will be tantamount to nationalization.

All this shows that nationalization is something that must be regarded as on the move; something that affects (as we have said) investors and consumers or users of (say) public services as well as labour. Therefore one cannot understand why the opposition is not of a more strenuous nature. The fact must be put down to inappreciation of what it all means. Those who are asking for nationalization would be the last to follow it up if there were means for showing them, without the intervention of the extremist leaders, that it would be a bad thing for them personally. And there would be greater general interest in the question if investors and the public were shown how it would also affect them. That was the purpose of Mr. Mitchell-Innes, in addressing the shareholders of Consolidated Cambrian, Ltd. If nationalization were a good thing for the country generally, it would be a good thing for what should be the new triple alliance—capital, labour, and the consumer. If it is bad for one of them, it is bad for all; for they are all three essential the one to the other. The evidence that has been laid before the Coal Commission touching this question clearly points to the fact that nationalization must produce stagnation by the suppression of individual effort, initiative, and interest, and by the disturbance of the confidence of investors. It has always been so, that where individual work has been subordinated to central control, and competition wiped-out, operations have sunk into a rut, and an inflexible routine has become the day-by-day programme. What must be the results of this? The business, whatever it is, will not advance with the times. There will not be the same incentives in it; increased production will not ensue without there is increased economy; and the business must inevitably be less profitable. Then what about the pretty theories of labour ultraists who are clamouring for nationalization? How can all that goes to make for stagnation produce greater savings, better hours, better pay, and better everything—for labour. The consumers and the people who have saved money and invested it do not count—in the eyes of advanced labour. But what is subversive of the position of one is subversive of the position of the other, which is a thing advanced labour declines, in its own faulty wisdom and fancied infallibility, to recognize.

We cannot be taxed with being great lovers of the coal industry, or rather of some of its past methods; but the gas industry does not want to see the coal industry made a big part of the wedge of nationalization. Nor as a large user of coal does it desire to see anything done that will make its own coal conditions worse than they are, or normally have been. Better the old conditions (bad as they were) than new ones which would be worse, and which would be an ill-stroke at private enterprise generally. We do not wish to put our hands into the pockets of investors in colliery properties, so long as they act fairly by us, any more than we want people to put their hands into our pockets to plunder us. And here we have one of the strong points that Mr. Mitchell-Innes made. It is that the Sankey report which the Government are proposing to get endorsed by legislation means confiscation of 40 p.ct. of the coal profits. We have not looked into the matter to ascertain whether there are any qualifications to be made to the submission in this respect of Mr. Mitchell-Innes. He spoke of the increased costs upon the coal industry that the report will produce; and the confiscation is arrived at in this way: In the two years before the war, the sale from the coal mines was 290 million tons, and not 250 million tons per annum. The average profit for the two pre-war years was 1s. 8d. per ton, which on 290 million tons represents £25,000,000 profit. But the Sankey report only reckons 1s. 2d. per ton on 250 million tons, which would amount to £15,000,000; so that the report only proposes to leave the coal owners 60 p.ct. of their pre-war profits. We are not prepared to say that any real injustice is being done so far as coal is concerned; but limitation of profit should have the incentive of an additional reward for any reduction of (say) average prices to consumers. Here, again, naked limitation in this way in the case of coal must be looked upon as a beginning of something important to investors and to industry, or as a precedent. Where is profit limitation going to end? Is it going to affect capital investment generally? Is it going to help to starve our industries of capital? Is it going to help to destroy individual initiative, effort, and enterprise? If it and nationalization are really menaces in these directions, then we are on the verge of political changes that bode no good for the country. The result of the Coal Commission's investigation into the question of nationalization will be awaited with not only interest, but anxiety. If their report is favourable, it will be for the country generally to refuse to be forced into nationalization at the instance or at the dictation of any one section of the community.

Since the foregoing article was written, information comes to hand that any attempt to nationalize the coal industry will be strongly resisted in the House by members representing trade and industry generally. A meeting of such members has been held at which a resolution was

passed, expressing the view that the nationalization of the coal industry would be seriously detrimental not only to the trade itself but to the interests of the nation as a whole, and resolving to constitute a Committee to take parliamentary action to resist such an unprecedented change. Developments are to be closely watched by the Committee.

Utilizing the Waste Heat of Gas-Engines for Increasing Efficiency.

THE platform of the Society of Arts has often been used for bringing to the notice of the world developments which promise to have considerable influence upon its fortunes; and it has lately been performing the same pleasurable duty in connection with heating and power developments. It has been shown from its platform, by both Sir Dugald Clerk and Prof. W. A. Bone, that developments have made good way in the gas industry that have greatly improved its position (already high) in respect of thermal efficiency, and that its situation as a provider of a labour-saving fuel has been put far beyond the reach of its one labour-saving competitor. These pronouncements constituted warnings to the Government to drop their visions as to electricity becoming the heating agent of the future—a position it can never attain other than at prodigal expenditure of the country's coal resources, even if general heat supply by wire were a practicable thing, which it is not from more points of view than coal conservation. Since these events we have had Mr. J. S. Highfield, M.Inst.C.E., M.Inst.E.E., showing the Government and the public from the same platform that the great electrical schemes cannot possibly reduce to any material extent the costs of electricity production in comparison with what is now done in the richly endowed industrial areas. On top of this comes the paper (an abstract of which appeared in our columns last week) by Mr. Frank Acland, M.Inst.C.E., in which he shows that the new "Still" engine is a development promising much economy for industry, and which will therefore (if its behaviour under experimental conditions is reproduced under working conditions) affect the considerations which have so lavishly, and with much evidence of irresponsibility, been attached to the electrical schemes. In the discussion on Mr. Acland's paper, it was suggested that the Government should examine into all prime movers before going ahead with their electrical plans; and Mr. Frank Bailey (with all his prepossession for electrical operation) gave expression to the view that the economy of the Still engine might make it worth while for factory owners to instal comparatively small power units, and so seriously interfere with the load factor of large central stations, and vitiate the whole idea of the Government's electrical plans. This is the place where (as we have before remarked) the Government failed, in that they did not make a complete survey of the power and heating field before launching out on their speculative electrical course.

While convenience will always help electricity in furnishing a part of the motive power requirements of industry, economy of other energy agents will also secure for them considerable preference among manufacturers. Gas and other internal combustion engines have long held the superior place in respect of heat efficiency. There have been considerable attempts made to bring about further improvement in this respect—in one way by the use, for the generation of steam, of the waste heat which passes through the surfaces of the combustion cylinder as well as into the exhaust gases. This is the basis of the development of the Still engine, in which gaseous or liquid fuel is employed, together with the steam provided by the waste heat—the steam expanding in the combustion cylinder itself on one side of the main piston, the combustion stroke acting on the other side. In this way the power of the engine is increased and the consumption of fuel reduced per horse-power developed. The idea is not new, as Sir Dugald Clerk mentioned in the discussion. Simon, in 1878, used the waste heat of internal combustion engines for producing steam; but in this case there was failure, owing to the admission of the steam into the combustion chamber along with the explosive mixture. Then there was the Castner-Kellner engine, producing, if worked on continuous full load, 2½ lbs. of steam per brake horse power at 100 lbs. pressure, compared with, in the Still engine, 7 lbs. per brake horse power—this being a maximum with a four-stroke constant volume engine at full load. The quantity of steam depends upon the efficiency of the combustion cycle, and on the load. However, with this engine, Mr. Acland speaks of a total indicated efficiency of 41 p.ct., and a possibility of reaching 46 p.ct. "A gas-" engine which can give a brake thermal efficiency 30 p.ct. " better than its predecessors, and which by governor control " alone can meet any demand up to, and including, over " 100 p.ct. overload, while maintaining a good efficiency at " the increased output, cannot be neglected." That is so. But now we shall be looking for the operation of the engine under working conditions fulfilling the promise to which it has given birth under experimental conditions, associated with which has been Prof. Vernon Boys, F.R.S., who, it is acknowledged, has contributed largely to the progress made since the inception of the Still system. Points about which we have to learn more are the costs of construction, and as to whether the successes with the test engines will be repeated with the larger sized ones.

Sliding-Scale and Co-Partnership the Best Control for the Coal Industry.

As Mr. D. Milne Watson said in his evidence before the Coal Commission last Thursday, the gas industry, as an enormous customer of the collieries, has a strong aversion to their nationalization; and this is a matter upon which the customers have as much right to be heard as the miners. At the same time it has to be remembered that, in the first report of the Commission, Mr. Justice Sankey and those members whose signatures appeared in company with his made it perfectly clear that they were dissatisfied with the existing system of ownership and working in the coal industry, and had decided that some other system must be substituted for it—either nationalization or a method of unification by national purchase and (or) by joint control. The present system therefore stands condemned; and what the Commissioners have now to discover is the best system to apply in the interests of all concerned. And what man, woman, or child in the country is not concerned in this matter, though he or she may not be a coal owner or a coal worker? It seems to us that, as there must be some system of fresh control, it should be of a kind that is as void as it can be of complexity, while yielding the maximum effectiveness—something that can be easily applied, without creating a great deal of disturbance, and withal something that will yield level-handed justice as between owners, miners, and the public.

It seems to us the scheme Mr. William Cash, F.C.A., put before the Commissioners is one which should command, as we have no doubt it will do, their serious consideration. The details are published later in this issue. It is founded upon Mr. Cash's experience in the gas industry with the sliding-scale, and all the developments that have issued from it in the shape of co-partnership schemes, works committees, and other benefits for the men. In normal times the sliding-scale plan did beneficent work for consumers, proprietors, and workers; but the war has shown the necessity for greater elasticity, so that the sliding-scale will not automatically bring about a grave injustice when abnormal circumstances arise, or when there is such a change in economic conditions that the terms upon which the standard prices and dividends are based have no longer any existence. The experience of the gas industry shows what is good, and what should be avoided. However, that by the way. Mr. Cash believes that a sliding-scale and co-partnership scheme with the auxiliaries that go to make for fair dealing between proprietors, workers, and consumers could be applied to the coal industry; and all the control necessary could be brought about under such a scheme. In the first place, however, it would be necessary to bring the coal industry into the position of a statutory one. This could be done by the passing of a General Act, providing that no one should engage in mining for the sale of coal without the authority of an Order. A body of Coal Commissioners could be set up who would settle the terms of the Order to be granted to each undertaking, including the application of the sliding-scale and the principles of co-partnership. The attendant developments, as illustrated by the gas industry, all making for interest and peace on the part of the workers, would follow. It seems to us Mr. Cash has constructed from experience a scheme which could be readily applied to the coal industry, give all the control that is necessary, and ensure protection of the interests of all having a title to consideration.

Collection of Data—A Practical Difficulty.

There may not be agreement in every detail with what the author said, but it can be conceded that it was a very useful paper that Mr. D. C. Cross submitted during Institution week (which was a bad selection of time from our point of view), at a meeting of the Southern District Junior Gas Association. We recently made the point as to the systematic collection of data by the Institution of Gas Engineers [see first editorial article in the issue for May 20]; and what Mr. Cross proposes is practically the same thing with a variation of procedure. It is not suggested that the "JOURNAL" article inspired Mr. Cross; there is here merely the coincidence of two minds working much in the same direction. There is no care on our part as to how or by whom the data are collected, so long as it is thoroughly and systematically done, and compiled so that it is available and is an advantage to the whole industry. He suggested that the work should be undertaken by the juniors, subject, of course, to the returns being initialed by their chiefs, with an understanding that names of works should not be divulged, but that designation should be by letter or number. A practical difficulty that we foresee is that, when compiled, to make the data available to the whole industry would be rather a costly matter; and our experience is that digests receive, in the gas industry, little purchasing patronage. If, therefore, such a scheme matures, it should be done in association with the National Gas Council, so that the industry itself bore the expense of the compilation, printing, and circulation.

A Common Interest.

However, Mr. Cross asks the managements of gas undertakings to take a broader outlook upon the industry, and to regard their works as units of a whole, the interests of which, for the common good, they should serve by the disclosure of all information of value. The stronger the industry can be made in its entirety, the better for its individual parts. But we are not prepared to admit that exclusiveness and secrecy are as rampant in the industry as the paper appears to suggest. We agree there is not unity of action in respect of the disclosure of valuable information; but, on the whole, the gas industry is the most open of which we know in the matter of the circulation of intelligence as to developments and fresh knowledge. Several processes are suggested towards the end of the paper on which it would be valuable to have authoritative data collected. The data, being available in the form suggested, would enable every gas engineer to ascertain where in any particular his own working fell below the efficiency of similar plant in another works, having an approximate equality of conditions. We hope the matter will not be allowed to rest, but will mature in some form, for there is value in it.

Verticals and Troubles.

Mr. Cross makes some pointed references to the working of vertical retorts. He declares that good points are spoken about; troubles hidden. "If," he remarks, "a little more was said about the troubles experienced, we should the sooner be able to devise methods to overcome them, and thus make even more efficient plant of the verticals." The framing of this statement suggests that the troubles are not insuperable. There has often in the past been mention of troubles, but less frequently to-day than formerly, which is a natural thing with a new process undergoing improvement by experience. The fact proves to us that the troubles have not arisen without responsible men having attacked them with a view to suppression and future avoidance. Against the point made by Mr. Cross, there are engineers of considerable experience with verticals who are at the present time arranging for their extension, or for complete new installations. They are not doing this without good cause, particularly in view of present costs of constructional work. We know well that in cases coals have given trouble—Durham coal, for instance, containing a large amount of dust. On the other hand, there are vertical installations in which a variety of coals are being used indiscriminately as they arrive at the works; and the engineers report that they have no difficulty where control is of the right order. With steaming, a good nutty coal is a decided advantage. We know, too, in some installations of verticals there has been trouble with the heating; but this is not a universal experience. However, both subjects—coal and heating—in relation to vertical retort working might receive searching investigation.

Transitional Trade Policy of the Government.

The Government appears to have a transitional trade policy which has had indiscriminate application in the past—at any rate, the gas industry has not found any particular benefit from it. Now we have a new President of the Board of Trade in the person of Sir Auckland Geddes. It is not known whether this will produce any change in the differences that have existed in the application of the transitional trade policy; but it ought to do so, if the policy has any real existence, and its application is to be co-ordinated. Regulations are in operation regarding the import of paper, the effect of which is to restrict it. Sir Auckland, questioned in the House the other day, stated that the reason the restrictions had been imposed was in order that the paper industry, which was entirely disorganized in different parts of the country, might have the opportunity of re-establishing itself in normal conditions. The gas industry has been disorganized in a manner that has brought heavy losses on investors in it, and through no fault of those responsible for its management. All the heavy increases in costs are due to the war, and to economic conditions that have had complete transformation owing to the war. But the Government have not given the industry any opportunity for re-establishing itself the same as they have afforded the paper industry. Perhaps the President of the Board of Trade will say whether the paper industry is to be limited to a dividend of $2\frac{5}{8}$ or 3 p.ct., less income-tax. If not, it would be interesting to know whether he regards such dividends as fair for investors in the gas industry, and not for the paper industry. If he does not think them fair, perhaps he will help the industry to get the parliamentary travesty of justice removed.

Oil Exploration at Home.

The fever over the preliminary success of the Hardstoft oil-boring near Chesterfield is running very high; and those concerned in the drillings are eager to push on. The borehole has been completely filled with oil; and boring has been resumed, now that the flow is well under control. The oil is somewhat thicker than that which was first drawn. Mr. J. L. Hackford, B.Sc., F.I.C., who has tested it, reports that it is a free oil of high quality, and will compare well with any of the known commercial oils of the world. Of course, nothing can be said yet as to the possible resources. At the Brimington and Renishaw wells, work is proceeding. Much gas and water have been met with at these borings; but the latest report before going to press is that oil has not yet been reached.

The London County Council and Gas Standards.

A conference has been convened by the Board of Trade for the 16th inst., in connection with the report on the subject of gas standards, which has been made to the department by the Fuel Research Board. Mr. James Ollis, the Chief Officer of the Public Control Department of the London County Council, has been appointed to represent that body at the conference.

Transactions of the Société Technique.

We have been favoured with a copy of the Transactions of the Société Technique, which contains a full account of the business at the general meeting of June 7, 1918, reports of committees, technical papers, and discussions. The volume opens with the decree, signed by the President of the Republic on April 7, 1916, recognizing the Society as a Public Utility Establishment. An interesting appendix is a review of legal proceedings in 1917-18 which affect gas undertakings.

Waverley Association of Gas Engineers.—The annual meeting of the Association in Edinburgh next Friday will be presided over by Mr. Alexander Bishop, of Newton Grange, who will deliver an address.

British Scientific Products Exhibition, 1919.—On account of the large number of applications that have been received by the Organizing Committee of the forthcoming Exhibition of British Scientific Products, all the space available at the Central Hall, Westminster, has now been allotted; and no further applications can be considered. The exhibition will be open to the public from July 3 to Aug. 5. Its scope will be more extensive than was possible at last year's display, when war conditions made it necessary to withhold from public view much of the scientific and technical work carried on in Great Britain. Striking testimony will be furnished of the enterprise of British manufacturers, and the uses that they have made of science and invention in new industries and the development of old.

ELECTRICITY SUPPLY MEMORANDA.

THE intelligence is out that Sir John Snell has been earmarked as the Chief Electrical Commissioner if the Government Electricity Supply Bill reaches the dignity of an Act. If it does so, it is clear that it will not be until the measure has been thoroughly overhauled. The reception it has met with in the electricity industry is described as being "mixed." It is a very appropriate term. The more the inner meaning of the Bill sinks into the minds of those in possession, the more objection they see to it. They have much for which to blame themselves. They courted the financial and other assistance of the Government, they asked for exclusive privileges for the industry, and for release from the bondage of existing statutory enactment and control, and the creation of an *ad hoc* Board of Commissioners to deal only with electricity supply. They saw in this the means to an end, and the end special favour. Wisdom ought to have shown them that their desires were not likely to mark the maximum line that the Government would fix upon. It is a habit of the Government to find out a way of imposing something in excess of desires. The electricity industry to-day would rather, if it cannot get a modification of the Bill to its own specified lines, be left to develop in its own way. One authority—"Meteor"—finds a noticeable chilling-down of the early enthusiasm as to super-stations. His belief is that existing stations have a useful life to run, and that drastic new constructions will be exceptional for some years.

In Excess of Desires.

All the organizations and existing controlling authorities outside Government domination are asking for large amendments in the Bill; and some of them are diametrically opposed the one to the other. What suits the companies does not suit the municipalities. The gas industry is also in certain respects moving through its National Gas Council; and it will want a very clear understanding that its own statutory rights are not violated by section 2 of clause 15 of the Bill, to which attention was called at the foot of p. 425 in our issue for May 20. As to the bodies directly representing the electricity industry, the Institution of Electrical Engineers have had a special discussion on the provisions of the Bill. The Provincial Electricity Supply Committee, the Incorporated Municipal Electrical Association, the Electrical Power Users' Association, and the London County Council have spoken, and have indicated the amendments they require. The men of the industry must be among the most credulous specimens of humanity if they believe all they have been told. Evidently a good many of them have done so; and their vanity has been tickled by one of the best argumentative deceptions ever invented. At the meeting of the Provincial Electric Supply Committee, Mr. H. B. Renwick stated that "they had been told that it was the one industry on which the future prosperity of the country was to be built-up, and which was to rescue the trade of the country from possible bankruptcy." Yet we have been informed lately that the cost of power only represents 1 to 2 p.ct. of the total turnover of a factory, and only between 3 and 6 p.ct. of total works' costs. How any small difference in cost that reorganization of the generating power of the electricity industry could work the predicted industrial miracles is something beyond the ken of most men who are not electricians or politicians of the advanced order, whose extremist notions often mean retrograde movement. How legislation in these matters is manufactured was shown at the same meeting by Mr. George Balfour, M.P., and Sir Kingsley Wood, M.P., the former of whom declared, and the latter agreed, that there was not one man out of fifty in the House who knew anything about the Bill. Mr. Balfour is convinced that the Bill is a bad one for the people of Britain as well as for the electricity industry. However, speaking generally, there is opposition to nationalization, to the terms on which it is proposed to take over generating stations and main transmission lines, to the composition of the District Boards, to the terms of compensation to officers and superannuation, and to the industry being placed under the Ministry of Ways and Communications; while the London County Council, among other things, wants to keep controlling power of electricity loans in the London area. The Incorporated Municipal Electrical Association also wish unremunerative areas developed on national grounds at the national expense. Cool! If in the case of electricity, why not in that of gas? Looking at the electrical requirements, the Bill must be electrically bad from start to finish.

A Very Bad Bill—Electrically Regarded.

At last one man in the electrical industry has really tried to say something about Sir Dugald Clerk's Royal Society of Arts paper, and the relative positions of the gas and electricity industries in the matter of thermal efficiency. The author is Mr. Hugh M. Goody; and the fact that his article (which appeared in the "Electrician") is composed largely of assumption and hope is not his fault. It is due to two causes—that he is not personally responsible for the weakness of the electrical foundation in respect of thermal efficiency, and that one cannot get more than a pint of anything out of a pint pot. The first blunder that Mr. Goody makes is to adopt Sir Dugald Clerk's figures as to the B.Th.U. required at gas and electricity works per candle-power-hour on consumers' premises without telling his readers that against the gas which the B.Th.U. (in its case) represent have been charged the whole of the heat units absorbed in the process of making not only gas, but coke, tar, sulphate of ammonia, sulphur, and so on. In other words, gas is made throughout Sir Dugald's calculations to bear the entire heat burden of the production of the whole of the commodities derived from the carbonization of coal, and some of which have great heating value. There is another point which Mr. Goody fails to make for the consolation of his electrical readers; and it is that there have been developments in the gas-making process which will, if Parliament does not foolishly harness the gas industry, make things a bit more troublesome for electricity from the competitive point of view. And speaking of competition, the consumer does not care much how the B.Th.U. are distributed at the producing end—whether 94 or 95 per cent. are on the average at present required at the electricity station to produce 5 or 6 p.ct. of B.Th.U., or whether the existing efficiency of the gas-works process is 70, and will as changes in plant are effected rise to between 80 and 90 p.ct. All the consumer is concerned in is the price of the B.Th.U. or the candle-power at his end, and the value he can get for his money. Despite, too, all that Mr. Goody says as to the decadence of the illuminating power of mantles (which is one of his assumptions, and does not occur if the burners are periodically attended to), gas can give the consumer cheaper B.Th.U. than electricity for producing candle-power-hours, as well as a better quality light. Of course, the photometer has often shown us that electric-lamps have great inconsistency between their marked ratings and their candle-power performances, that lamps out of the same batch give varied illumination, that as filaments deteriorate and bulbs get dirty, the illuminating power drops off considerably, and that then there is the heavier bill than mantle costs for electric-lamp renewals. The best has not been said in Sir Dugald's paper; there is something in hand.

Mr. Goody Criticizes Thermal Efficiency Data.

Mr. Goody threatens the gas industry with the half-watt lamp for domestic lighting. The honest electrician calls it "a gas-filled" lamp. When the threat matures, unless the lamps are well shielded, the electrical industry ought to have the right to tax the excess profits of oculists and opticians; for, as the "Electrician" has (if our memory is loyal) often told its readers, such lamps ought to have no direct communication with the delicate organs of vision. Then the shielding will require an enlargement of the quantity of B.Th.U. per candle-power-hour. Not only does Mr. Goody admit that the assertion is but an "assumption" on his part that the average illumination during the life of a gas mantle is only two-thirds of its nominal value, but he devotes a paragraph to the proportions of use of half-watt and one-watt lamps compared with incandescent gas-burners; and then he tells his readers that the figures are, "of course, based on pure assumption." This is not a very strong or scientific way of putting things, nor of dealing with such a paper as that of Sir Dugald Clerk. We cannot help our friend to correct hypothetical figures as to the relative proportions of the use of gas and electric lamps; but, as bearing upon the point, it may interest him to have the following from the address which the President of the Institution of Gas Engineers (Mr. Samuel Glover, M.Inst.C.E.) delivered just a fortnight ago:

Assumption and Lamp Use.

> For those of us who are public lighting engineers as well as gas manufacturers, the following census (just recently taken) of lamps used for public lighting in 1000 cities and towns of Great Britain and Ireland shows that, of a total of 670,286 lamps, 585 550 are gas and 84,736 electric—giving a proportion of 87 p.ct. of gas lamps as against 13 p.ct. of electric lamps used for this purpose.

Then we have quite a pretty piece of argument, which, when the bottom of it is reached, is humorously grotesque. Mr. Goody takes, "in support of the conclusion at which he has arrived," the Coal Controller's old figures for gas and electricity equivalents—800 units of electricity and 15,000 c.ft. of gas as the respective equivalents of a ton of coal. Of course, Mr. Goody knows full well these are not "equivalents" in any sense; they were more or less arbitrarily selected by the Controller. We ask the critic of Sir Dugald Clerk how many electrical stations are producing, on the average, a unit of electricity per 2·8 lbs. of coal? And how many are likely to, taking local conditions into consideration? Moreover, gas-works restore to the fuel market from every ton of coal, when only about 12,500 c.ft. of gas is made, about ½ ton of coke; so that only ½ ton of the coal is actually expended in producing gas, tar, ammonia, sulphur, and so on. However, Mr. Goody says the 800 units will, at 1 25 watts per candle-hour, give 640,000 c.p.-hours; whereas, at 20 candles per cubic foot, 300,000 c.p.-hours only will be obtained from the 15,000 c.ft. of gas. Good! But, unfortunately for Mr. Goody, we find that the poor consumer will at 6d. per unit have to pay £20 for the 800 units, or at 8d. £26 13s. 4d.; while for the 32,000 c.ft. of gas, which will give him 640,000 c.p.-hours, he would have to pay, at the war-time price of (say) 4s. per 1000 c.ft., £6 8s. It is indeed necessary for electricity to have something to say for itself on account of cleaning and decoration, which is an argument that has been much discounted since more of the heavy hydrocarbons have been taken out of the gas without affecting its

A Poor Electrical Argument.

calorific power more than from (say) 3 to 5 p.c., and since gas is being supplied which requires less air to produce complete combustion, which lends itself to ready admixture with air, and which needs but little regulation. Besides all this there are the respective costs of installation and maintenance, which do not show an advantage for electricity unless cheap or scamped work is put in.

Room and Water Heating.

As regards heating, our friend says the position is somewhat different; and, "on the face of it," gas has the advantage. We will leave at that his remarks on this point. There are plenty of authoritative figures by men whom Mr. Goody would not dare to accuse of infidelity to scientific accuracy who credit the modern gas-fire with sending as effective heating value into a room, 75 to 80 p.ct. of the heat generated by the gas, and this with the far cheaper B.Th.U. than electricity can supply. Not only "on the face of it," but actually gas has the advantage. Some other points made by Mr. Goody regarding heating have been dealt with in the "Memoranda" at various times. Respecting water heating, he builds on the efficiency of the total "immersion" system for electricity. If, however, we cannot immerse a gas-flame in water, we can supply any quantity —bulk supplies or small supplies—of hot water quicker and cheaper than can be done by any electric system. People are not inclined, and the electric station would not wish them to do it generally, to put in electric installations which would give them rapid water heating. The expense would be too great; the intermittent pull on the electric station too severe to be borne. Really it is not worth while wasting time further discussing this very rare and feeble electric plant.

The Power Question.

Coming to motive power, Mr. Goody says that Sir Dugald Clerk states that the gas-engine gives a return of 14·5 B.H.P. for every 100 units used at the gas-works, while electricity returns only 10·5 B.H.P. "If this is so," adds the critic with little solid fact to support him, "it is a little difficult to understand the popularity of the electric drive, and the very general impression among power users that electricity is, at any rate for small units, much the most efficient form of energy." "If it is so!" Is it not so, Mr. Goody? And "if it is so," we of the gas industry do not find it difficult to understand the popularity of the electric drive for small units. Convenience explains much; and where it is convenient, and economy does not count (in some cases convenience itself is an economy), people would be foolish not to adopt it. "That it is at any rate the cheapest service, the extending use of the electric motor goes to prove," is a statement to the truth of which we do not subscribe. It depends upon circumstances—circumstances depending upon running duration, number of machines in long-hour use, load, and many other factors. Mr. Goody, in this and other parts of his article, does not prove anything. He "doubts" this and that, and "probably" is a favourite expression. The gas industry with its own potentialities, if it has a fair field and if no preferential favour is shown electricity, does not fear the super-station and all the gigantic plannings which unfortunately have obfuscated the political mind to such an extent that other matters of equally serious importance to the nation have been by-passed.

Gas and the Housing Scheme.

A fully illustrated descriptive booklet has been prepared by the Richmond Gas Stove and Meter Company, Limited, on the subject of gas in connection with housing schemes. The attention that has been devoted to this subject of late, both at meetings and in the pages of the "JOURNAL," has been proof of how closely the industry is concerned; and the booklet before us is a welcome contribution to the discussion. It is prepared so as to be suitable for distribution among housing committees, architects, builders, surveyors, &c., and the Richmond Gas Stove Company are offering supplies of it to gas undertakings who would like to circulate it in their own towns. As the result of the publication of the book being advertised in several of the architectural and building papers, a large number of requests for it have been received; and those who made the requests will be glad that they did so—for the sketches of installations, and the information given, must prove of great value to those called upon to design or to superintend the erection of dwellings under housing schemes. In discussing a paper on the subject of gas for housing schemes read by Mr. W. L. Westbrook before the London and Southern District Junior Gas Association [as reported on another page of this issue], the President, Mr. S. B. Chandler, drew attention to the need for putting-up a gas show-house on all estates of any considerable size. Emphasis is given to this contention by the following statement which the Richmond Gas-Stove Company make in forwarding a copy of their booklet: "We have had a report from two parts of the country this week where the local electricity department are considering the erection of sample houses fitted throughout with electrical appliances for domestic use; and it therefore shows the need for the fullest co-operation on the part of both gas suppliers and manufacturers of apparatus, in order that in the new housing schemes gas may be sure of that supremacy which it is to the undoubted advantage of both the nation and the householder it should obtain." The firm have done their part handsomely in preparing the booklet; it is now up to the gas undertakings to see that advantage is taken of it.

PERSONAL.

Mr. ALEXANDER WILSON, whose recovery from an operation on his eyes was recently recorded with much satisfaction in the "JOURNAL," has since intimated his desire to retire from the position of Engineer and General Manager of the Glasgow Corporation Gas Department. He has been nearly thirty years with the Corporation, and has occupied his present position since 1903.

The King has been pleased, on the occasion of his Majesty's Birthday, to give orders for a number of promotions in, and appointments to, the Most Honourable Order of the Bath. Among the Knights Grand Cross is Sir HUBERT LLEWELLYN SMITH, K.C.B., Secretary to the Board of Trade. The honour of Knighthood is conferred upon Mr. HARRY COURTHOPE-MUNROE, K.C., for valuable services at the Board of Trade.

For reasons of health, Mr. W. UPTON has resigned the position of Secretary of the South Barracas (Buenos Ayres) Gas and Coke Company, Ltd. He has been succeeded by Mr. M. DENNE.

Sir GEORGE BEILBY has had conferred upon him by the Durham University, the honorary degree of D.Sc.

By 27 to 21 votes, the Halifax Town Council last Wednesday approved the Gas Committee's recommendation that the salary of Mr. W. B. M'LUSKY, the Gas Engineer, be advanced from £800 to £900. Similar opposition was offered to the advancing of the salaries of four other chief Corporation officials; but the minutes were adopted in each case. Mr. M'Lusky's increase dates from April 1.

The Leeds Corporation Gas Committee have appointed Mr. BENJAMIN A. BURRELL Gas Examiner, for testing calorific values and making analyses of gas, and furnishing monthly reports.

At the London County Council Gas-Meter Testing Office, White Lion Street, Spitalfields, last Friday week, a presentation was made to Mr. EDWARD W. SCOTT, the Senior Inspector of Gas-Meters for the County of London, on his retirement from his post after 43 years' public service. The Chief Officer of the Public Control Department of the London County Council (Mr. James Ollis)—who was supported by Mr. W. J. O'Donnell (Chief Assistant) and other members of the headquarters staff—presided. Mr. J. W. Britton, of the Gas-Meter Company, Ltd., attended, as representing the gas-meter industry. Mr. Ollis referred in high terms to the zeal and fidelity with which Mr. Scott had carried out his duties. He said that he had given satisfaction to the public, the gas companies, and the meter manufacturers; and he would carry into his retirement the knowledge of a life well spent in the public service. Mr. Britton bore testimony to the courtesy which Mr. Scott had always shown. The testimonial took the form of a framed illuminated address.

OBITUARY.

After no more than three days' illness, Sir BOVERTON REDWOOD died of diphtheria last week at his residence in Avenue Road, Regent's Park. He was taken ill just after he had completed an analysis of oil from the new boring at Chesterfield. At the time of his death he was in his 74th year, and for half-a-century had devoted himself to the subject of petroleum. In course of time, he became Technical Adviser to the Admiralty, the Home Office, the Corporation of London, the Port of London Authority, and other Government Departments and public bodies; and in 1912 he was appointed a member of Lord Fisher's Royal Commission on Oil Fuel for the Navy. When the war broke out, he found a place on various Government Committees; and on the formation of a Petroleum Supplies Branch at the Ministry of Munitions early in 1917, he was selected as Director of Petroleum Research. Later in the same year he was transferred from this position to that of Director of Technical Investigations in the Petroleum Executive. He was also Chairman of the Gas Traction Committee; and he took a leading part in the foundation of the Institution of Petroleum Technologists, of which he acted as first President in 1914-1916. He was created a knight in 1905, and a baronet in 1911.

Sir THOMAS FOWELL VICTOR BUXTON, Bart., who died on the 31st ult., as the result of a motor accident, was a Director of the Commercial Gas Company.

Sir R. H. Inglis Palgrave, F.R.S., of Wrentham, Suffolk, who was Chairman of the Great Yarmouth Gas Company, left estate of the gross value of £47,456.

Last Tuesday afternoon the members of the Edinburgh and East of Scotland Section of the Society of Chemical Industry daid a visit to the works of the Broxburn Oil Company, Ltd.

The 184th quarterly meeting of the Manchester District Institution of Gas Engineers will be held at Ossett on Wednesday, the 25th inst., under the presidency of Mr. A. E. Mottram. By the kindness of the Chairman (Alderman H. Robinson) and the members of the Ossett Corporation Gas Committee, the visitors are invited to inspect the gas-works, and afterwards to partake of luncheon in the Ossett Town Hall. In the afternoon, there is to be a business meeting, at which Mr. John Bond, of Southport, will open a discussion on the "Fuel Research Board's Report and Its Effects on Manufacturing Methods."

THE WORLD'S SUPPLY OF NITROGENOUS FERTILIZERS.

By Dr. GEORGE W. ANDERSON.

THE war has brought home to farmers as well as to the people at large the importance of artificial manure in order to increase the yield of our home-grown products; but owing to the enormous consumption of the munition industry, private consumers had to be cut short of their requirements, particularly as regards nitre, whereas sulphate of ammonia was available in limited quantities. The prices for nitrogenous fertilizers have advanced with the increasing demand and the cost of production, so that consumers are looking forward to a revision of the present prices, which is expected in view of the enormous quantities now available, as the demand for ammunition has ceased.

The total world's production of nitrogenous fertilizers and products has been increased considerably during the war; so that great competition will ensue, in which Germany is likely to play an important part. The whole question is of such vital importance that it warrants a close scrutiny of both the present and the future situation.

The following resources of nitrogen are available for supplying the world with nitrogenous products:

(1) Natural nitrate of soda, occurring as a mineral chiefly in Chili, besides smaller deposits in India, &c.
(2) Nitrolim, calcium cyanamide, which is artificially produced from calcium carbide and nitrogen of the air with the aid of a strong electric current. In the beginning its production was chiefly confined to countries with large water power, such as Norway and the United States; but it is now being manufactured in practically all countries.
(3) Artificial nitrate of lime, chiefly produced from oxygen and nitrogen of the air with the aid of an electric arc. Owing to the heavy consumption of electricity, it is almost solely manufactured now in Norway—the country of cheap water power.
(4) Ammonia as a bye-product of coal distillation, chiefly recovered in gas-works, coke-ovens, the shale industry, and, in smaller quantities, from gas producer plants.
(5) Synthetic ammonia, which may be either produced by the combination of nitrogen and hydrogen (Haber process) or by the action of steam on calcium cyanamide.

Ammonia is easily oxidized, forming nitric acid (Ostwald process), and thus becomes a source for the production of nitrates.

NITRATE.

Before the war practically all countries were supplied with nitre from Chili, the production of which was increasing from year to year, owing to an excellent organization of the Chilian industry and very extensive sale propaganda. The total yield, which in 1900 only amounted to 1·42 million tons, reached in the last pre-war year (1913) 2·7 million tons. After the outbreak of war the exports suffered a considerable recession; and, in consequence, the production had to be restricted, so that in 1915 only 1·72 million tons of nitre were produced. However, this loss was soon made up by the increasing demands of the allies, particularly of the United States; the total output of nitre there in 1917 amounting to 2·95 million tons—a figure which is assumed to have also been reached in 1918. The United States alone imported in 1917 some 1·4 million tons, of which 45 p.ct. was required for the manufacture of munitions and 20 p.ct. for agricultural purposes. It is assumed that rural consumers in America will absorb the excess of imported nitre, after the demand for the manufacture of munitions has ceased.

However, as America is not capable of consuming anything like the possible output of Chilian nitre (which is estimated to be something like 73 million quintals=7·3 million tons (?)) and the European countries will probably require less than during the war, the nitrate producers have an anxious time ahead of them, and may be compelled to reduce their production in order to avoid amassing unwieldy stocks and a consequent recession of prices. The latter have reached an unprecedented figure, as much as 13s. 5½d. f.o.b. Chili being paid per quintal of unrefined nitrate; whereas in the first half year of 1914 only about 6s. per quintal was quoted.

According to a late announcement of the Board of Agriculture, a certain amount of nitrate is now available for farmers at £20 per ton (90 p.ct. pure), which does not compare favourably with the maximum price for sulphate of ammonia fixed at £16 16s. 6d. per ton, which contains about 20·5 p.ct. of nitrogen, as compared with about 15 p.ct. of nitrogen in the nitrate of soda. It is fully expected that other nitrogenous fertilizers will take the place of nitrate, and that nitrate of soda will hardly regain its former predominant position in the world's market. Although the nitrate industry would be able to reduce the present prices considerably if the Chilian Government would grant a reduction of the export tax, which now amounts to about 4d. per kilogram, £16 13s. per metric ton, of nitrogen (= about £2 10s. per ton of nitrate), the prohibitive prices of coal and the shipping freights will prevent this industry from seriously endangering the position of artificial and other nitrogenous fertilizers which gain more ground every day. This refers particularly to the enormously increased production of artificial fertilizers in Norway and Germany, both of which come into consideration when the European market is concerned.

NORWEGIAN SALTPETRE.

Nitrate of lime is produced in Norway from atmospheric oxygen and nitrogen with the aid of the electric arc, to a limited extent; the total output reaching in 1913 only 70,000 tons, and in 1918 45,000 tons. The production of this fertilizer has not developed to the extent at first anticipated, as the cost of production is rather high, owing to the enormous consumption of electric current. For one ton of calcium nitrate (13 p.ct. N) from 10,000 to 12,000 units are required, whereas calcium cyanamide (18 to 20 p.ct. N) can be produced with about one-third of this quantity of electricity (3800 units). In consequence, the production of the former has been limited to countries where cheap water power is available.

NITROLIM (CALCIUM CYANAMIDE).

The enormously increasing world's production of nitrolim reached in the last pre-war year the considerable total figure of 285,000 tons, which now it may safely be assumed is largely exceeded, as in most countries existing plants were enlarged and new ones added. In Germany, where in 1913 only 52,000 tons were produced, plants of a considerable size have been erected during the war by private firms (Bayerische Stickstoffwerke, Knappsack) and the Government (Priesnitz, near Bitterfeld), with a total potential capacity of 635,000 tons = 117,500 tons of nitrogen. The cost of production is estimated to be about 8½d. per kilogram of nitrogen—pre-war prices for material being assumed. This figure, however, seems to be under-estimated, as the cost of the electric current required for the production of 1 kilogram amounts to about 7½d., assuming a current consumption of 19 units per kilogram at 0·4d. per unit. However, it seems possible to sell the product at about 1s. per kilogram of nitrogen, which compares very favourably with the present prices paid for any other nitrogenous product in England or elsewhere. Germany is not able to consume the quantity produced, and will naturally seek to export the excess, which is particularly favourable, as long as the rate of exchange is against her.

SYNTHETIC AMMONIA AND SULPHATE OF AMMONIA.

A somewhat alarming figure has been reached by the production of synthetic ammonia in Germany, which is chiefly manufactured by the Badische Anilin und Soda Fabrik at Ludwigshafen (the Haber process). It is maintained by the manufacturers that it represents the cheapest way of producing nitrogenous fertilizers; the synthetic ammonia being particularly suitable for conversion into nitric acid on account of its great purity. The above-named firm have plants of a potential capacity of 950,000 tons (calculated as sulphate of ammonia)=195,000 tons nitrogen per annum, and are supposed to produce ammonia at 6d. per kilogram. This however seems rather low, as the hydrogen and nitrogen required for the process would cost 2d. alone—viz.:

1·00 kg. N_2 = 1·61 cb.m. at 0·5d. = 0·805d.
0·212 ,, H_2 = 2·41 ,, at 0 5d. = 1·205

2 010d.

This figure may safely be taken to be twice as high, as other costs involved in the manufacture of sulphate of ammonia are not taken into account; so that the actual sale price will not be lower than 1s. per kilogram of nitrogen (=£10 5s. per ton of sulphate of ammonia). Considering, however, that pre-war prices of sulphate of ammonia varied between 1s. 1d. and 1s. 4d. per kilogram of nitrogen (=£11 0s. 1d. and £13 13s. 4d. per ton of sulphate of ammonia), Germany is in a position to compete easily with the natural product, and may greatly endanger our home market. Already before the war the increased production of sulphate of ammonia in Germany disquieted the ammonia market considerably; so that makers could not readily dispose of their products. This was also partly due to the fact that our home consumption did not increase at the same rate as the production—1901, 70,000 tons; 1912, 90,000 tons—so that the British manufacturers greatly relied on export, where they met with some German competition.

Exported to	Germany.	England	Total Exports.
	Tons.	Tons.	Tons.
Belgium	15,775	5,169	20,944
France	7,428	8,964	16,392
Italy	3,551	5,922	9,473
Netherlands	18,195	2,872	21,067
Switzerland	1,337	..	1,337
Spain	2,550	52,382	54,932
Denmark	455	..	455
India	16,024	38,046	54,070
Hawaii	2,541	7,143	9,684
British Guiana	..	6,549	6,549
Japan	..	114,648	114,648
Mauritius	..	4,976	4,976
North America	5,630	37,067	42,697
Central ,,	..	..	..
South ,,	428	..	428
Brazil	..	..	..
West Indies	..	2,459	2,459
British India	818	..	818
Other countries	1,136	30,051	31,187
Germany	..	8,453	8,453
Total	75,868	324,701	400,569

Germany had become an exporting country in 1906, after having been unable to satisfy her own demands until that date. At the same time the total export of the two countries together had not much increased—amounting in 1910 to 345,000 tons, as compared with 400,569 tons in 1913. England had the largest share in the last figure—viz, 324.701 tons; whereas Germany's quantity was 75.868 tons.

The latter seems small in itself, but may be taken as a warning for the future, as Germany's production increased rapidly since 1900 (104,000 tons of sulphate) to 1913 (565,000 tons of sulphate).

—	Production, 1,00.	Production, 1910.	Production, 1912.	Production, 1913.
	Tons.	Tons.	Tons.	Tons.
Germany	104,000	375,000	492,000	565,000
England	217,000	369,000	379,000	414,700
United States	27,000	116,000	151,000	..
France	37,000	56,000	69,000	..
Belgium	33,000	38,000	50,000	..
Netherlands		4,800		..
Austria-Hungary	35,000	100,000	190,000	..
Other countries	10,000	55,000		..
Total	463,000	1,113,800	1,331,000	..

Conclusions.

From the foregoing it will be seen that the production of nitrogenous products in Germany has been greatly promoted during the war, and that, in consequence, a strong competition may be expected, as Germany will not be able to absorb the total production herself, after the demand for munitions has ceased.

The following table shows that there is a considerable excess of production over the probable consumption for which the last pre-war figure (1913) may be taken as the outside. Although the cost of production has gone up considerably, German manufacturers were able to write-off their plant during the war, and thus have the great advantage of low capital costs. This, together with the present favourable rate of exchange for exports, places the German trader in an advantageous position.

Production and Consumption of Nitrogenous Products in Germany.

—	Per Cent. N.	Consumption. 1913.	Tons. N.	Production. 1913.	Tons. N.	Production. 1919.	Tons. N.
Saltpetre	15·0	750,000	112,500	..	..	..	..
Sulphate of ammonia	20·5	460,000	94,300	530,000	108,650	530,000	108,650
Synthetic ammonia	..	..	..	35,000	7,170	950,000	195,000
Nitrolim	18·5	87,000	16,000	52,000	9,620	635,000	117,500
Norwegian saltpetre	13·0	38,000	5,000	..	..	..	..
	..	1,335,000	227,900	617,000	125,440	2,115,000	421,150

NATIONAL IMPORTANCE OF PRICE OF COAL AS AFFECTING THE PRICE OF GAS.

By Norton H. Humphrys.

As the possibility of a return to former parliamentary obligations referring to the quality of gas, with or without some readjustment, will shortly come on for consideration, the time is opportune for a review of the quality of coal now being supplied to gas-works, seeing that a consistent and indispensable feature connected with a return to anything approaching pre-war qualities is a removal of restrictions that prohibit the supply of pre-war qualities of coal. Working on commercial lines, no one can extract 16-candle or 600 B.Th.U. gas from dust and dirt. Stringent quality clauses under present conditions would in many cases simply mean absolute inability to comply, with a plea of "unavoidable causes" in answer to proceedings for default, or, as an alternative, the use of carburetting processes that would certainly add to manufacturing costs, and might enhance distribution difficulties, complaints of soot or smoke, &c.

Outside gas circles, the general tendency is to regard this as a domestic matter, limited to considerations of administration, finance, or profit, and to ignore the fact that its effects extend far beyond the walls of the board-room. Take the case of an undertaking formerly able to sell at 3s., with a margin of 10d. available for dividend, but now at 4s. 6d., having a margin of only 6d. The shareholders have sacrificed part of their profits, and thus avoided a further advance of 4d.; but the whole of the 1s. 6d. passes straight to the user, and has the effect of increasing his bills to the extent of 50 p.ct. And the user is directly interested in the quality of coal, so far as it figures in this advance of price.

During war time, gas undertakings have, without complaint, accepted all sorts of stuff up to 70 p.ct. of dirt and dust, regarding the delivery as a temporary expedient, and under the impression that the better qualities were imperatively needed, directly or indirectly, for the defence of the Nation. But though active hostilities have ceased for six months, and with them all requirements for special war purposes, there is not the slightest indication of improvement in quality. The only change is the diversion from "war purposes" to "export." The temporary expedient has attained a more permanent character that admits of indefinite extension, and with it goes an important item in the selling price of gas. The difficulties have been met by assistance from reserves; but these are limited in character and in many cases entirely depleted. So a continuation of present conditions means a further tax on the consumer.

An important and peculiar feature is that the deterioration of quality is not general. Some collieries have not varied in this respect up to date, while others have more than doubled the proportion of dust and dirt. The only explanation offered is the partial or entire shortage of labour for picking over the coal at the collieries, which would only account for sizable fragments. It does not explain increased proportion of dust, or of incombustible matter in that form, or the extraordinary variation, from a trifle up to very serious proportions, as between one colliery and another. Perhaps some continue to send out a fair through section of the whole seam, while others reserve the tops and bottoms for the gas-works. Or, at present prices and the absence of all competition, it may be profitable to work seams that would not pay or find a market under fair trade conditions.

Given an unaltered quality of coal and a free sale of residuals, increased costs of material and labour may be covered, with assistance from improved carbonization processes and better sales of residuals, by a comparatively small increase in the price of gas. Some undertakings are taking credit for this fact as evidence of superior management, to the detriment of their less fortunate neighbours who, even with a sacrifice of half the profits, are unable to carry-on with a less advance than 1s. 6d. or more. I venture the opinion that in the absence of exceptional circumstances, any increase exceeding 6d. to 8d. per 1000 c.ft. is due to less value received for expenditure under the heading of "coal," which increases working costs by diminished through-put and make per ton and a smaller quantity and poorer quality of coke available for sale.

This is far from being a trifling matter from the consumers' or from a national point of view. The total gas-works consumption of coal throughout the country is about 20 million tons per annum. Adding a reasonable estimate for carburetted water gas, this would represent 250,000 million c.ft. of gas; and there would also be nearly 10 million tons of coke available for sale, which would replace a similar weight of coal, and save the cost of raising and transport. Valuing the gas at 4s. per 1000 c.ft. and the coke at 25s. per ton, we arrive at a sterling value of £62,500,000. An addition of 1s. per 1000 c.ft. to the price of gas means an increase of £12,500,000 in the annual gas bill; and a reduced production of coke will add to the already congested condition of the transport service. Even in these days of economy envelopes, combined with reckless expenditure for purposes decidedly outside the ordinary taxation range, this item affects not only domestic but also industrial expenditure, both in respect to home and foreign trade, to an extent that calls for serious attention.

Is the connection between gas consumption and industrial usage properly assessed or recognized? The word "industrial" is a sort of pet phrase that carries a very uncertain meaning. It may be confined to distinct processes on a large scale, such as the melting of metal, or applied to a residue that is not included in lighting, heating, and cooking. A glance through "A Thousand and One Uses for Gas," as published by the British Commercial Gas Association, goes to show that, so far from industrial consumption being limited to 10 to 25 p.ct. of the whole, it comprises the greater part. Used in a comprehensive sense, it includes all gas employed for lighting, cooking, warming, hot baths, &c., in factories, warehouses, offices, and shops; the entire consumption at railway stations; and figures in all cases of home consumption where lucrative occupation is conducted in the dwelling house or in rooms attached thereto. Evidently a large share of the additional 12½ millions goes to handicap industrial enterprise, more especially on a small scale; and our best financial authorities agree that private enterprise was never of more importance than at the present time, and that as such it should be encouraged and supported in every possible way.

The Government have recognized the urgent necessity of cheap power for industrial purposes, to the extent of plunging heavily in the dark in the direction of new and untried schemes of a stupendous character, apparently sharing with the so-called representatives of labour the belief that the capital reserve held by the British taxpayer is inexhaustible. And yet these prominent facts relating to gas have not been recognized. It is up to the gas industry, as represented by the National Gas Council, to see that neither the Government nor consumers continue in ignorance of the exact position. No advantage is gained by locking the stable door after the horse has been stolen; and the nation cannot meet the urgent and immediate need for cheap power to assist in grappling with foreign competition by a scheme that at best will require years for its full development, during which we shall be rapidly losing trade. A starving man is not assisted by a guarantee for a hearty meal in a week's time; and an immediate need calls for an immediate remedy. This is to be found in prompt assistance and encouragement of existing resources—such as the removal of restrictions that tend to force an increase in the price of gas and at the same time are not essential to bare national necessity.

GAS INSTALLATIONS FOR HOUSING SCHEMES.

SUGGESTIONS FOR SECURING EFFICIENCY.

By W. L. WESTBROOK, of the North Middlesex Gas Company.

[A Paper read before the London and Southern District Junior Gas Association, May 30.]

Most of us who are interested in the sale and distribution of coal gas are doubtless agreed that our commodity should, where available, be the principal agent for the production of heat for domestic purposes in connection with national housing schemes. Though gas as a lighting agent is far from played-out, and will compete with electricity for the lighting of the prospective new dwellings, it is in the wider field of cooking, heating, and hot water supply that gas, owing to its convenience, adaptability, ease of control, cleanliness, and the great saving of labour, as compared with solid fuel, affords the greatest service to the public by lightening the labour of the housewives and bringing comfort and convenience to the homes of the people. In order, however, that our fuel may be used to the best possible advantage, the work must be carried out thoroughly well from A to *Z*.

In speaking of national housing, the class of houses under consideration will be those having a spacious living-room, combined kitchen and scullery, possibly a parlour, two or three bedrooms, and a bath room. The estates must be served with adequate mains, and the services and carcassing done while the houses are in course of erection. A probable maximum consumption for this type of house would be about 150 c.ft. per hour. It would, however, be advisable, in order to minimize variations in pressure, to lay a 1¼ in. service-pipe.

METER AND SERVICES.

A convenient and accessible position should be reserved for the gas-meter, which, to measure the gas for cooking, heating, and hot-water service, would need to be a 20-light one. Coal-cellars are not suitable places in which to fix gas-meters.

My specification for the carcassing work would be as follows: Outlet and riser, 1¼ in. First floor: Run 1¼ in. to cover bath-room, lay ¾ in. geyser supply off 1¼ in. to foot of bath, diminish from 1¼ to ¾ in. for three fire supplies. A ½ in. pipe to be carried to each fireplace, and not more than two fires to be served by the ½ in. pipe. Ground floor: Lay 1 in. pipe to cover cooker and hot-water apparatus, ¾ in. branches off 1 in. for both of the above, ½ in. to copper, ¾ in. supply with ½ in. branches for two fires, and ⅜ in. branch for gas-iron. Lighting service: From 1¼ in. outlet, and separate from heating. All points to be securely plugged, and work to stand absolutely sound by pressure-gauge. If, as is desirable, it is possible to arrange for complete gas hot-water apparatus to be included in the plans and specifications, the geyser supply need not be included. It would be a great advance in securing efficiency if it could be arranged for the architect to include the gas apparatus in the plans and specifications. Proper arrangements could then be made for the reception and ventilation of the appliances.

COOKING.

The cooker should be fitted in the scullery; a tiled range-opening with chimney for efficient ventilation being provided for its reception. The cooker should be provided with a plate-rack, or, as an alternative, a plate-rack could be fitted across the opening over the cooker. It would also be possible to arrange a hot-closet at the top of the opening, which would be heated by the waste gases from the oven and hot-plate of the cooker, the hot-closet forming a duct, with the inlet for the waste gases at one end, and the exit at the other.

If desired, in order to facilitate the removal of the cooker for cleaning, it could be arranged on a low stand mounted on wheels, and the cooker fitted with a specially constructed detachabie joint, which would allow it to be drawn forward out of the recess for the purpose mentioned. It would be necessary to have securing hooks to steady the cooker in position after re-connecting. The gas-cooker recess and chimney should back on to the fireplace of the living-room, in order to facilitate the connecting-up of the coal-fired boiler (which I would recommend for the living-room) to the storage of the combined gas hot-water apparatus. The gas hot-water apparatus and gas wash-boiler should be arranged on either side of the cooker opening, so that the same chimney would take away the waste gases from the whole of the gas apparatus.

HOT WATER.

The hot-water apparatus I should instal would be combined apparatus, comprising gas-boiler and 20-gallon storage cylinder fitted with thermostat and cut-out valve, which, when baths were not required, would enable the amount of water in circulation to be reduced to about 5 gallons. When this quantity was heated, the thermostat would operate and cut the consumption of gas down to a few cubic feet per hour, thus ensuring great economy of fuel, in addition to providing a useful amount of very hot water in the minimum of time.

GAS-FIRES.

In order to stop the undoubted waste of fitting register grates in bedrooms and parlours, where they are very unlikely ever to be used, tiled surrounds should be specified. Should perchance a coal-fire be needed at any time, all that would be necessary would be to provide one of the loose fitting and removable barless type of coal-grates. All bedroom fires should be fitted with a boiling-ring; and I should here like to remind manufacturers that we are still waiting for a well designed and convenient side ring attachment for nursery fires. Most of the existing types have the tap underneath the ring, with consequent risk of one being burned or scalded in turning off the gas. It should also be remembered that nursery fires are often surrounded by a high fire-guard; and when ring and tap are fitted a few inches from the floor, they are most inaccessible and inconvenient. Some authorities have under consideration a scheme of central heating, with coke or anthracite as a fuel, and with separate installations for each house. The communal system has been mooted; but it is not finding much favour, one chief objection being the equality of payment for inequality of service. I am of opinion that, except for blocks of flats under the same roof, the system is not advisable.

While there is much to be said in favour of warming houses throughout by the medium of "radiators" and a boiler, with only the one fire to keep going, it is pretty generally recognized that heating by convection alone does not give satisfaction in this country, with its damp and variable climate; and the provision of one coal-fire at least in each house will be advocated. It is just here that the gas-fire scores; one of its many advantages being that it is always available at a moment's notice (by simply turning on a tap and lighting a match) to afford the necessary warmth, when any sudden change and drop in temperature make it desirable, whereas in the case of central heating, or even lighting a coal-fire, in many cases one would sit in chilly discomfort rather than take the necessary trouble to get the fire laid and lighted. Or maybe by the time the radiators or fire began to give duty, the room would not be any longer required.

The question of fuel storage and the transport of solid fuel, either coke or anthracite, to hundreds, or perhaps thousands, of consumers, in small quantities, at irregular intervals, and in all weathers (especially when snow makes transport difficult, which is, of course, when heat is most required) is a point in favour of gas.

COST OF A GAS INSTALLATION.

The cost of a gas installation such as I have indicated would be somewhere about £60, and would be made up, and I would suggest apportioned, as follows:

Service-pipe (say) 50 ft.	£4 10 0	Charged to Builder.
Carcassing eight points	10 0 0	"
Hot-water apparatus and fixing	20 0 0	"
Gas-copper and fixing	4 10 0	"
Fixing 20-light meter	1 5 0	Tenant
Cash price of cooker	5 10 0	"
One gas-fire at £2 10s. 0d.	2 10 0	"
Three gas-fires at £3 10s. 0d.	10 10 0	"
Fixing four fires	2 0 0	"
Gas-iron and fixing	1 5 0	"
	£62 10 0	

The cost per house to the builder would be £39. As far as the tenant is concerned, he would no doubt be able to obtain the cooker and fires on simple hire, if he did not wish to purchase them; and by adopting gas as his fuel, he would not only ensure efficient service for himself and household, but be serving the national interest by the conservation of fuel.

DISCUSSION.

The paper was followed by a more or less conversational discussion, in which many of the members referred to details of the apparatus proposed—particularly in regard to ventilation and hot-water supply.

Mr. J. HEWETT asked whether the estimated cost of £60 for the gas installation was based on present prices, and also in what district it was proposed to fit-up these installations, and the class of tenant who would be expected to occupy the houses.

Mr. WESTBROOK replied that the costs were based on present-day figures. He quite anticipated that the question of the tenant having to incur the outlay would be raised. This was why he mentioned that the tenant would no doubt be allowed to take the cookers and fires on hire. Apart from these, he had not very much to buy. It might possibly later on become compulsory on tenants to use gas instead of solid fuel.

Mr. G. F. COX pointed out that gas companies are interested in coke; and he was surprised to find nothing said about the coke-boiler as put forward by the London Coke Committee. It would be rather a good idea to have a portable pattern of gas-fire, which would do away with the necessity for having a separate fire in each room.

Mr. WESTBROOK said he did not mention coke-boilers because he was not altogether in favour of them for these housing schemes. There were, of course, alternative plans which he had not mentioned, as he particularly wished to give prominence to this special arrangement. Coke-boilers would not be likely to appeal to the kind of tenant he had in mind for these dwellings. There was a distinct demand for portable gas-fires. Personally, he did not think one obtained the best results from fires temporarily connected. He would always strongly advocate fixing fires with sheet iron.

Mr. W. E. BROWN asked what was the rental value of the house under consideration.

Mr. WESTBROOK: That is rather in the nature of a puzzle. It rests with the Government at present.

Mr. BROWN remarked that there was no one scheme which would do for every class of house.

Mr. WESTBROOK said he simply mentioned the class of house, and left the rental open, as that must vary according to position. Modi-

fications would necessarily have to be made in the scheme to meet local requirements.

Mr. F. AINSWORTH thought most of them would be rather frightened at the expense of the installation. He was afraid that in Ilford, if they wanted to get a look in, they would have to find something very much cheaper than this.

Mr. WESTBROOK said his advice was to try and see what they could do. Tenants would not be in a hurry to take houses unless there were gas-services laid. He did not see why gas companies should put in services free of cost, when water companies and everybody else charged for the work they did. He thought in the past gas companies had spoiled the public in this way. If one had a good article, the public would pay a fair price for it; and he thought the gas companies had a good commodity.

Mr. F. PEARCE agreed with Mr. Westbrook's remarks on the question of mains and services. He had very rightly advocated the provision of adequate pipes. At the North Middlesex Gas-Works, on a Sunday between 1 and 2 o'clock, they sent out exactly double the amount of gas in one hour that they sent out during their heaviest lighting hour in the winter. It was not the slightest use making gas at the works if one could not supply it because the mains were too small.

Mr. S. BEVINGTON, referring to nursery gas-fires, thought it would be advisable to put them out of reach. He suggested that the cock might be placed just under the mantelpiece.

Mr. WESTBROOK pointed out that the tap must be placed within a reasonable distance, to facilitate lighting. It could have a square head and a removable key.

The PRESIDENT (Mr. S. B. Chandler) said it was a surprise to him that no one had mentioned the gas show-house. He was a great believer in putting a show-house on every estate of any considerable size. This placed before the potential tenant exactly what could be done by gas in housing schemes. Certainly, Mr. Westbrook had made one or two very good points—especially in regard to the question of centralizing the heating. In this country, people were not in favour of that; and if it ever came about to any large degree, it would mean considerable loss to the gas industry. As to gas-fires, he would not care to see a large number of these put out over estates on simple hire; and he considered the builder should supply such fires, in bedrooms, especially in substitution for coal grates. A house of the character Mr. Westbrook had outlined could be very conveniently lighted with a very small consumption of gas. He (the President) would suggest that nothing but inverted burners of medium and bijou sizes should be installed. Taking nine of these burners for the house, the consumption would not amount to more than 24 c.ft. per hour; and reckoning this at 4s. per 1000 c.ft., the cost would be 1·2d. per hour to run the whole installation, giving a light of somewhere about 400 candles. The question of maintenance was important; and assuming the gas undertaking was in a position to offer maintenance at 9d. per burner per quarter, and if they allowed 5s. per annum for renewing half the number of globes, there was a total cost per year for maintenance of 32s. This meant that the candle power would be maintained at the consumption for which the burner was set, at a cost of perhaps ½d. per hour. Now, what about electricity? If the electrical people had to supply 400 c.p. by 1 watt metallic filament lamps, they would have to charge for two-fifths of a unit, which, at 8d., came out at somewhere near 3d.—or, at any rate, considerably over the 1½d. per hour. It would be different with the ½-watt lamp; but even if this lamp could be made in sizes suitable for small rooms, gas would be able to meet it on the cost point. For convenience, the pneumatic switch should be installed, and maintained along with the burners. He was a great believer in governing the pressures, and thought the time would come when gas undertakings would have to supply an efficient governor, in the same way that they now had to furnish a meter.

Mr. HEWETT, referring to a point which had been raised, as to the advisability of specifying a 1¼-in. service-pipe, remarked that as soon as one got above an ordinary 1-in. pipe, the delivering area increased in a greater proportion. A 1-in. pipe gave 0·78 in., and a 1¼-in. pipe 1·2 in.—an increase of nearly 60 p.ct. by the addition of ¼ in. to the diameter.

NEED FOR CLOSER COMRADESHIP BETWEEN WORKS AND COLLECTIVE INFORMATION OF WORKING RESULTS.

By D. C. CROSS, Assoc.M.Inst.C.E., of Lea Bridge.

[A Paper submitted to the London and Southern District Junior Gas Association, May 30.]

Some engineers of medium or fairly small gas-works have, perhaps, little or no opportunity of experimenting with different types of plant and methods of manufacture, and often have to form an opinion, or judge of the merits of two or three types of apparatus, principally from observations in the Technical Press, the special pleading of the makers of such apparatus or plant, or from statements made by other engineers who may at the time be only expressing a casual opinion without any actual facts to support their statements. On the larger sized works, conditions are often different. Here the engineer has the opportunity and staff to thoroughly investigate between the different methods and types, and can work out a fairly accurate comparison of the initial, working, and maintenance costs, which is of immense value to him when considering the reconstruction or extension of plant. Unfortunately for the gas industry in general, a good deal of the detail of this information, when obtained, is kept secret by some of the larger companies, and is not offered or placed by any means at the disposal of the smaller engineer, who may not have the opportunity to find out these things for himself.

I have felt that some of our leading engineers sometimes lose sight of the fact that the whole energy of the gas industry should be united and combined to fight against our common rivals; whereas some energy is wasted in competition between engineers in trying to outrival each other. If one can devise some method to make more gas, coke, tar, or sulphate per ton, or sell his gas a penny cheaper than his neighbour, he will often keep this knowledge to himself, in order to show better working results, instead of offering it to his less fortunate neighbours in order that they may use it to the advantage of gas over electricity in their district. After all, no company is in direct competition with another in the same district; and no company would lose a penny by giving the experience gained on their works to another, whereas it may be the means of saving another company some hundreds of pounds. Another real trouble, and cause of waste, is that some information when given is useless. It has been so doctored or distorted to try and prove a certain piece of apparatus is an astounding success—or, to say the least, not a failure—that many men are misled and adopt the apparatus, which may be an endless source of trouble to them.

May I cite the case of vertical retorts? What a tremendous amount of literature has been written to prove the wonderful working results obtained from vertical retorts; but how very little has been said openly of the great troubles they have given engineers. If a little more was said about the troubles experienced, we should sooner be able to devise methods to overcome them, and thus make an even more efficient plant of the verticals. This is not said to belittle vertical retorts, but rather to emphasize the saying that, "We learn by experience." If it was the trouble we were told of, the hearer would be put on his guard to avoid them.

Coals play a tremendous part in the smooth running of verticals; but what attempt has been made to collect information as to what is the best coal, and which causes greatest trouble? An engineer starting-up a set of vertical retorts should be able to find out at once what coal is the most suitable, and which will cause him trouble and hang-ups.

The foregoing statements are very general; and I appreciate the fact that many engineers during the war were always ready to, and did, give the gas industry the whole of their experience and working results on certain new problems. But at the same time a considerable amount of information is withheld. If a piece of apparatus or method is a great success, it may be well boosted; but if it is a partial failure, very little is said to save others from falling into the same mistake.

A year or two ago I suggested to a few gas-works assistants that the collecting together of working methods and results of certain gas manufacturing plant on all their works might formulate information of very considerable value. This was at once squashed, as most of them admitted that if they gave any information away in connection with their company, they would be severely reprimanded, and it would be no use asking their chiefs for permission.

What I wish to put before you this evening is whether it would be possible for us juniors to approach our chiefs, and obtain permission from them to make tests, look-up records, collect working results, and give the full particulars to a small Select Committee, who would endeavour to sift out information of value for our members, and perhaps for the industry as a whole.

All information collected would be treated as confidential; and I would suggest that reports made should have no names on them, but be known by a number. The key to the numbers would be held by the Chairman of the Committee only, and not be made generally known. All reports and tests made by the juniors should be first submitted to their chiefs before sending to the Committee. We could insist on their being first initialed. This would safeguard engineers against indiscretions by their juniors. The collection of information and making of tests is essentially the work of the juniors, as the chief engineers in these days are too fully occupied with administrative duties to be able to spare time to carry out tests or work out particulars of plant. Of course, the summary or conclusions obtained would be placed at their disposal for use.

I would like to hear from members whether they think it would be possible to obtain the permission of their chiefs to form a Select Committee of three or four members of this Association to carry out investigations on gas manufacturing plant, while a second Committee be chosen to work on distribution subjects. These Committees would draw-up a schedule of the information required on certain subjects, together with suggestions of how tests should be carried out, and what records should be kept, &c. This schedule would be distributed to members who are in a position to obtain the necessary information, and each member be asked to co-operate and obtain as many particulars as possible, to be forwarded, after perusal by his chief, to the Committee, who would tabulate the results, and if practicable arrive at some useful conclusions.

It is essential, if the scheme is to be of the slightest use, that all information of tests, working, and maintenance costs should be the whole truth and nothing but the truth, and not in the slightest way camouflaged or doctored to cover a defect or bad result. In working costs, we must have not only the wages of men regularly engaged on the plant all day, but also all casual and incidental labour and material required for the full maintenance of the plant. No doubt the Committee would suggest that

certain records be regularly kept to obtain correct information on the maintenance and running cost of plant.

This collection of information, making of tests, and keeping of records would entail extra work on a good many of the juniors, but I think it is worth it. Most of us who are engaged on a good deal of routine work may often regret that we cannot spare more time for research. Here is an opportunity for all to take part in a big research policy, each doing a little bit; and the collective result may be of great value to every one of us.

In making tests and collecting data for the Committee, you will be surprised at the valuable information you will obtain for yourself. You will find plant working far nearer its maximum capacity than you realize, and sometimes quite the reverse; the running cost of other plant higher than it should be; and perhaps the maintenance charges on a piece of apparatus in excess of the initial cost of the apparatus. These points are not realized in the ordinary day's work; but when set out for a special purpose, as in this case, they are made very noticeable.

May I in conclusion give you a few examples of the kind of problems we could with benefit tackle?

1.—Coal and coke handling plant. The advantages and disadvantages of one system over another. The running and maintenance costs of different systems. What is the cheapest power to drive coal and coke conveyors, and the most efficient methods of handling coal.

2.—Carbonization of coal. It is the many small details in the retort-house we should study. How the different methods of working create a higher state of efficiency in the matter of quality and quantity of gas and residuals, and in the working of the producers. What methods are employed to keep a constant quality gas; and what is done to keep down the percentage of inerts in the gas.

3.—Much valuable information could be obtained from numerous tests made on the different types of boilers and boiler furnaces in use on a gas-works with the different kinds of fuel available. The efficiency of the various types could be compared. Very few engineers know the load on their boilers, and the working costs; and even if they did know, they have nothing with which to compare their results to give them any idea if the efficiency of their boiler is up to the average.

4.—The different methods and costs of obtaining the water used on the works.

5.—What is the average cost per unit at which a gas-works can generate its own electricity, taking into account all maintenance and supervision charges. Is it cheaper to drive the generator by gas or steam power?

6.—What are the comparative working and maintenance costs of electric and hydraulic power doing exactly the same class of work—such as lifts and stoking machines?

7.—What are the comparative working and maintenance costs of electric, gas, and steam power doing similar work? It can be set out per H.P. developed, or million c.ft. of gas handled. The advantages of one power over the other in certain circumstances.

8.—Efficiency of the different types of scrubbers and washers.

9.—Tar and liquor wells.—The devices to overcome loss of ammonia.

10.—The most efficient and cheapest methods of purification and the handling of oxide.

11.—The different methods, and working costs of boosting gas.

12.—The comparative advantages of running and maintenance costs of steam-turbine, steam engine, electric, and gas-driven power for fans or boosters.

13.—The different methods of lubrication, and systems to cut-down waste of oil on works.

14.—The best methods for lighting the different parts of a gas-works.

When once you sit down to think out the number of interesting problems of the above nature worth investigating, you will be surprised at the scores of them. I have only quoted a few as examples.

To come back once more to the usefulness of collecting data from many works. I could set out to obtain the working and maintenance cost of all the plant on my own works; but with no idea of what are the average results on other works, I cannot definitely form an opinion if any system or plant on my works is inefficient, or is costing more to run than it should. With the help of these collective data, and his own tests, an engineer may be able to put his finger at once on the points where improvement and greater efficiency can be obtained.

I hope I have not been too much of a disciple of Mr. Wilson's principle of "Idealism;" but I do feel we can take advantage of one of the greatest lessons of the war—and that is, "The greater the unity and efficiency, the more powerful and successful we shall be in our industrial warfare."

DISCUSSION.

The PRESIDENT (Mr. S. B. Chandler) remarked that unfortunately Mr. Cross had been unable to be present to read the paper himself, as he had been detained at the works.

Mr. J. R. GALE (North Middlesex Gas Company) said there was no doubt a great deal in what Mr. Cross had pointed out; but, on the other hand, he could see a certain amount of drawback in it. In the first place, it seemed to him that if one were allowed to go round and perhaps crib ideas from other works, it would rather tend to stultify initiative; and initiative was just what was wanted. Engineers were answerable to their directors for the working of their undertaking; and directors would doubtless prefer that the engineers should get ideas out of their own heads. Full comparisons of working appeared in the Press; and for explaining how things were done an Association like theirs very well met the case. The members visited different works, and saw what was done.

Mr. F. A. FROST (South Metropolitan Gas Company) said he was quite in agreement with Mr. Cross when he complained of the absence of freedom in offering information to other engineers. The position of the gas engineer to-day was not on a par with that of the ordinary tradesman, who could not be expected to give away to his competitors trade secrets. Whatever a gas engineer might give away to a fellow-engineer, it was obvious he would not suffer, as they did not supply the same district. On the other hand, there was every reason, for the benefit of the industry in general, why they should put their heads together and compile results of working. Quite a lot was heard now about vertical retorts, and they saw in the Press the excellent results obtained with them; but not much was said about the other side of the story. They did, however, learn things indirectly; and it was what they gathered otherwise than from the Technical Press which in some cases made them take what they heard from a direct source with a fairly large "grain of salt." Mr. Cross mentioned the hanging-up of coal in vertical retorts. There were, he (the speaker) thought, very few which worked smoothly from one week's end to another. It was being found out that, in order to get the best results from the system, it was necessary to have a particular kind of coal. This was exactly what people discovered years ago, when they went in for inclined retorts; and the price of this coal went up to a figure which often wiped-out the economy which would otherwise have resulted from the use of these retorts. It was felt that whatever system they went in for in the future should be capable of dealing with all classes of coal; and to-day there was no method except the horizontal retort which would fulfil this condition. Though, as far as results were concerned, they did not appear to be doing quite so well with horizontals as those who had verticals, he thought this was due to want of knowledge of what could be done. There was a lot of research needed on this line. With verticals, a larger make per ton was secured by steaming; and efforts should be made to definitely ascertain the best method of applying this to horizontal retorts. If this were done, he believed the horizontal retort had still a long future before it. As to the cost of producing steam on gas-works, they had to bear in mind that they had a large quantity of material suitable for steam raising, which they could not otherwise dispose of. Better results might be secured with steam coal or coke; but they had to use up the breeze somehow, or pay for it to be carted away. It could be utilized very economically under gas-works boilers, by means of forced draught.

Mr. J. HEWETT (South Metropolitan Gas Company) said they were very pleased to have these ideals put before them; but the difficulty in comparing results in any way whatever was to find out the conditions under which the results were obtained. Sifting out the figures would probably lead to some average which they might take as the ideal. But, here again, they were faced with the fact that very often only the best side of a question was put forward. There was no doubt that what Mr. Cross had said about horizontal retorts must be admitted. The inclined retorts some years ago came on the market, and did a great deal with a new installation. But the moment one began to be troubled with a variation in the class of coal that had to be used, the retorts became slightly distorted or small cracks, &c., appeared, and tended to hold-up the charge. These difficulties almost, if not quite, swamped any advantage which the so-called automatic discharge of the retort was intended to bring about. The horizontal retort would carbonize anything which would burn—especially as there were now mechanical appliances for charging and discharging retorts.

Mr. F. PEARCE (North Middlesex Gas Company) remarked that it seemed to him that they were rather missing the point of Mr. Cross's paper. He thought the idea was to discuss whether it would be good policy to form a Committee to collect data. He quite agreed with Mr. Cross that it would be a very excellent thing if such information could be collected; but he thought some of the difficulties in the way might be very real ones. An excellent end would be served if data could be secured in this way for the benefit of the whole of the undertakings of the country; and it would greatly help forward the end they had in view.

Mr. G. F. COX (Commercial Gas Company) said it would be very useful to get hold of these figures; but Mr. Cross being, as London companies went, on a comparatively small works, he thought he had overlooked the fact of the great difficulty on large works of tabulating results regarding particular plant. On a large works, unfortunately, it was not everybody who had the opportunity of going through special plant erected, because more or less they were side-tracked. They were put into different branches; and it was impossible for a man to spend all his time on one plant. Then on a large works particular plant could not be altogether isolated from the other plant; and full returns would be very difficult to obtain. Mr. Cross seemed to think that large works were able to collaborate, and get data together; but it would be difficult. At the same time, it would be useful if they could do as he suggested.

Mr. G. WINSLOW (Gas Light and Coke Company) said it was obviously correct that there was no connection between one works and another. Mr. Cross thought they as juniors should get permission from the seniors to carry out research work. The Manchester District Institution had already proposed to collect such data as the author referred to; but owing to war conditions their Association had been unable to participate in the movement. The course outlined by Mr. Cross might certainly do something to destroy initiative; and though the paper presented them with much food for thought, there was very much in it which it would hardly do for juniors to take up. It was more a matter for the Institution of Gas Engineers to collect information of the kind desired. It was not for the juniors to collect information for the seniors as a guide to how their particular works should be carried on.

The PRESIDENT remarked that the question was rather a delicate one to discuss off-hand. It would be useful to collect all data; but a certain amount of time would necessarily be involved, and who would pay for it?

THE CORROSION OF COKE-OVEN WALLS.

SALTS EXTRACTED FROM COAL BY WASHING.

By W. J. REES, F.I.C., of the Department of Refractory Materials, University of Sheffield.

[A Paper read before the Refractory Materials Section of the Ceramic Society.]

A necessary first step in investigating the corrosion of coke-oven walls was the determination of the salts present in the coal as charged into the ovens which would be likely to cause corrosion, and of the salts extracted from the coal in the washing process. Through the courtesy of Mr. J. H. W. Laverick, of the Tinsley Park Colliery Co., Ltd., of Sheffield, I have obtained the average samples of which the analyses are given below. The corrosion of the coke-oven walls at the coking plant of this colliery is comparatively severe, as it appears to be at all ovens in the Sheffield district where deep coals are coked.

The coals which are at present worked at this colliery are: The High Hazel seam, at a depth of 120 to 220 yards; the Barnsley seam, at a depth of 216 to 316 yards; the Parkgate seam, at a depth of 460 to 560 yards; the Silkstone seam, at a depth of 540 to 640 yards.

—	Water from Pumping Station.*	Water in Circulation in Washery.	Drainage Water from Washed Slack Hoppers.
	Grammes per Litre.		
Total solids	1·469	2·780	3·290
Lime	0·154	0·095	0·102
Magnesia	0·143	0·108	0·098
Sodium oxide	0·304	1·078	1·402
Potassium oxide	0·028	0·033	0·038
Chlorine	0·274	0·928	1·180
Sulphuric anhydride	0·480	0·593	0·626
Carbonic anhydride	0·069	0·051	0·044
Iron and alumina oxides	0·002	0·006	0·013
Silica	0·011	0·014	0·018

* This water is pumped from shallow workings only.

Probable Combinations in which the above Ingredients are Present in the Waters.

—	Water from Pumping Station.	Water in Circulation in Washery.	Drainage Water from Washed Slack Hoppers.
	Grammes per Litre.		
Sodium chloride	0·451	1·529	1·944
Sodium sulphate	0·149	0·524	0·768
Potassium sulphate	0·052	0·062	0·072
Calcium sulphate	0·243	0·168	0·165
Magnesium sulphate	0·357	0·264	0·261
Calcium carbonate	0 095	0·057	0·062
Magnesium carbonate	0·051	0·041	0·023

Solid Residues from Evaporation of Drainage Water from Washed Slack Hoppers.

	P.Ct.
Sodium chloride	60·87
Sodium sulphate	24·67
Potassium sulphate	2·20
Calcium sulphate	2·58
Magnesium sulphate	4·73
Calcium carbonate	2·82
Magnesium carbonate	0·87
Iron and alumina oxides	0 61
Silica	0·44
	99·79

	Unwashed Slack.	Washed Slack as Delivered to Ovens.
Sodium chloride, p.ct.	0·37	0·18
Sodium sulphate ,,	0·19	0·08

It is evident that sodium sulphate as well as sodium chloride is removed from the coal by washing. The pit water used in the washery contains a good deal of these salts in solution; but it is unlikely that there would be any increase in the dissolving efficiency of the washers by the use of a purer water. There would possibly, however, be a reduction in the quantity of dissolved salts sent to the oven, in the water adhering to the slack, by using a purer water. But it is unlikely that this comparatively small reduction would be worth the expenditure involved in using town's water. The rate of flow of water through the washery is possibly of greater importance as the concentration due to the solution of salts from the coal will be reduced with an increase in the rate of flow, and there will be a corresponding reduction in the salt contents of the water carried into the oven adhering to the slack.

The sodium sulphate present may be a factor of some importance in the corrosion of the oven walls. By interaction with the coal, at the temperature of coking, sodium carbonate will be formed, and will be a vigorous corrodant.

QUALITIES AND COMPOSITION OF SILICA BRICKS.

A recent paper by M. Dauphin, in the "Bulletin de l'Industrie Minerale," contains a summary of the author's experience in the manufacture of silica bricks. As a criterion of refractory quality, the silicon content would be a satisfactory measure, were not the exact determination such a laborious process. For practical purposes the best measure is afforded by the temperature of subsidence of a small pyramid similar to the Seger cone and composed of the material of the bricks with the addition of 6 p.ct. of ferric oxide. The temperature is between 1750° and 1735° C. for the best bricks, and should not be less than 1710° C. With 97 p.ct. of silica in the brick, the temperature should reach 1750° C. A reduction in the silica to the extent of 0·05 p.ct. corresponds on the average with a fall in refractory power equivalent to 1° Seger. The life of the bricks is also in correspondence with the percentage of silica. Arches of reverbatory furnaces constructed with bricks containing 97 p.ct. of silica have proved capable of withstanding more than 200 operations.

Alumina has a particularly injurious action, since it increases the fusibility. Its proportion should never be greater than 0·5 or 0·6 p.ct. In the case of lime, however, a reasonable proportion is not harmful; a content of 2 p.ct. provides bricks of good solidity without appreciably affecting fusibility. A considerable factor in the resistance and life of the brick is its porosity. It is found that only the capillary pores get filled with oxide of iron; the larger spaces remain empty, even in the case of an impregnated brick. M. Dauphin regards a brick as perfect if the impregnation does not reduce its melting point below the normal temperature obtained in the operation of the Martin furnace. This result is approximately obtained when the initial porosity of the brick is about 18 p.ct.

Under the action of heat, the silica suffers alterations of state which reduce its density. Quartz, of density 2·65, passes into the form of crystoballite, tridymite, or a fused isotropic form, all of a density in the neighbourhood of 2·3. The initial density is therefore of great importance, since it gives a sufficient indication of the swelling which will take place in the structure. The swelling is greater with bricks consisting of coarser grains; with those formed from impalpable powder it is practically *nil*.

Silica sufficiently pure for the manufacture of bricks exists as quartz, quartzite, gritstone, and siliceous sand. Inasmuch as quartz behaves differently along its different symmetrical axes, heat which gives rise to modifications in the position and properties of these axes thus produces deformations the extent of which are in correspondence with the degree of development of the crystals. It is therefore a necessary measure that the quartz should be ground, first in a macerator and then between vertical grindstones of four to five tons weight in order to reduce it to a state of division such that the coarsest particles will pass through a 10 or an 8 sieve. Any quartz, M. Dauphin declares, whatever its geological origin and physical appearance, may be used for refractory bricks if sufficiently finely ground.

The ground silica grains are malaxated with milk of lime, so as to form a sufficiently stiff paste containing 1·5 to 2 p.ct. of lime. The resistance is greatest for a content of lime of 2 p.ct., and is found to be improved the greater the proportion of water which can be used in making the paste. In moulding, the use of a hydraulic press is preferable to hand pressure, the compactness of the brick increasing with the pressure. Solidity of the brick is thus partly a question of strong ramming. Moreover, moulding by pressure allows of the porosity of the bricks being reduced by 2 or 3 p.ct.

Phenol in the United States.

In a note to the "Journal of Industrial and Engineering Chemistry," Mr. A. G. Peterkin, of the Chemical Department of the Barrett Company, New York, says that before the war the consumption in the United States of phenol was about 9 million pounds a year. The bulk of it came from England, and was obtained directly from coal-tar distillates. A small part was synthesized from benzol. At the time of the entry of America into the struggle, the production there amounted to 75 million pounds a year; and after that time the erection of plants proceeded at such a rate that, when hostilities ceased, the productive capacity was more than 150 million pounds per annum. Of this, however, not more than 2 million pounds were obtained directly from coal-tar distillates by extraction with caustic soda. It is calculated that at the present time the consumption in the United States is not much greater than 6 million pounds a year; while in private and Government hands to-day there are at the very least 30 million pounds of phenol. No adequate suggestion has as yet been made as to what should be done with it. Before the war phenol sold at about 9 c. per pound; and on a basis of pre-war prices for labour and material, Mr. Peterkin thinks it is possible that phenol might be synthesized from benzol at a cost of between 15 c. and 20 c. per pound. Were the present stocks absorbed, one or two synthetic phenol plants might operate and ensure a home production equal to America's needs at a cost no greater than a fair cost of imported phenol, *plus* the present duties. For the present, however, the plants are idle.

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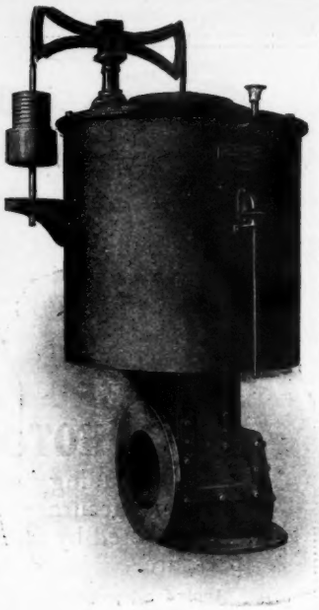

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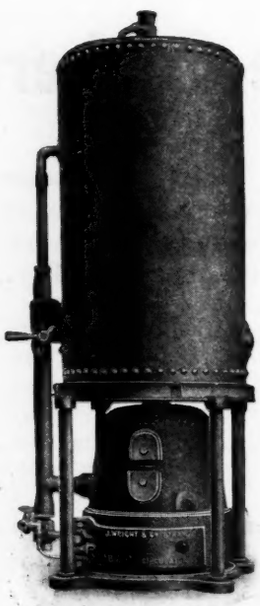
Telegrams: "METRIQUE, LAMB LONDON." Telephone No. 2412 HOP.



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CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Ex-Service Men and Vacancies in the Gas Profession.

SIR,—It gave me great pleasure to read Captain Staley's few words at the Institution meeting on behalf of the ex-service man. I can assure Captain Staley that he is not the only "Gasman" with an axe to grind.

There appears in your advertisement columns each week an appeal for ex-service men, in which you state "other qualifications being equal." How can a man with say four-and-a-half years' war service claim the same up-to-date experience as the man who stayed at home? The ex-service man should be, and is, entitled to receive sympathetic consideration. I know a case of a gas engineer who has had to accept a subordinate position at about half his pre-war salary, and the only "crime" he has committed is volunteering in 1914. I personally have applied for practically every job which has been advertised in the JOURNAL since November last, and in addition have had my own advertisement; and, up to date, the result has been *nil*.

Mr. Shadbolt states in his reply: "We make all kinds of efforts, &c., and we are satisfied that in most cases this is done." And when one reads the "Personal" column, the ex-service man's name is conspicuous by its absence. Although the statement may have been made in perfect good faith, my opinion is that it is not quite correct. I am alluding to the results, not the efforts. Perhaps the demobilisation Committee of the Institution could supply a tabulated list showing how many of the technical and administrative jobs which have been advertised in the JOURNAL since Nov. 11, 1918, have been given to ex-service men.

B.V.L. A.

June 5, 1919.

The Salaries Question.

SIR,—Referring to correspondence in your previous issues, I am asking you to publish this letter, hoping that a move will be made in the direction of establishing a Gas Clerks' Union, in order that the salaries of this body of public workers are substantially increased to rates which will ease the ever-growing burden of those now working for salaries ranging below 45s. in many cases for men of twenty-one and over.

Notwithstanding the high prices of living prevailing, one finds many clerks receiving less than 50 p.ct. increase over their pre-war pay.

Surely, now that most of the "boys" are home from the war and back at their old jobs, steps should be taken to establish a Union, and so obtain the just dues for the male clerical staff of our gas offices. Now then, who will start the ball rolling?

PENPUSHER.

June 2, 1919.

REGISTER OF PATENTS.

Extracting Hydrocarbon Products from Shales and Coals.—No. 119,648.

REED, V. Z., of Denver, Colorado; assignee of D. T. DAY, of Washington, U.S.A.

No. 8330; May 17, 1918. Convention date, Sept. 28, 1917.

In patent No. 123,415 there is described a process which has for its aim to combine extraction by solvents with destructive distillation, with the object of "recovering as great a percentage as possible of the volatile matter by the action of solvents at a low temperature and leave as little work as possible to be effected by destructive distillation at high temperatures, and therefore at high cost." The present process may also have this aim.

According to it, petroleum-bearing shales and coals are subjected, before distillation, to the solvent action of material containing an acid—this solvent being permitted to pass through the mass of shale or coal and the combined solvent, and extracted matter being recovered from the mass, which may then pass immediately to the retort. The acid-containing solvent may be a product obtained in vaporous form from the retorting of the shales or coal after the extraction, and the vaporous solvent may be admitted to the fresh cold mass of shale to be treated, and may condense thereon and pass down through it while exercising the solvent action. The acid content may be added, as and when desired, to the solvent material.

The invention is thus distinguished from processes in which solvent vapours and oils have been admitted to the materials in the retort; and it is also distinguished from a previous proposal to add acid to the shale or coal, either previous to or during distillation—the function of the acid being to combine with and fix the ammonia; some of the sulphate of ammonia passing over with water, and the remainder of the acid being found in the residue in the retort. The present invention, on the other hand, first treats the coal or shale with an acid solvent for extracting hydrocarbons—the solvent and the extracted matter being recovered from the coal or shale before the latter passes on to the retort.

Carbonization of Wood.—No. 124,274.

SPICER, H. H., of Upper Thames Street, London, E.C.; a communication from John Wells, of Cairo.

No. 4925; March 20, 1918.

This "apparatus for treating wood or other carbonaceous material in order to produce gas, and at the same time a highly carbonaceous material having a relatively low content of volatile matter—as, for instance, charcoal," broadly comprises a carbonizing chamber and a gasifying chamber so interconnected that the material from the former chamber may pass into the latter, and means whereby part of the carbonized material may be withdrawn at a point between that at which the material is fed in and the point at which air, or a mxture of air and water vapour, is introduced into the carbonized material to be oxidized for providing the necessary heat. This consists of a suitably formed duct extending from the inner surface of the carbonizing chamber into a vessel adapted to contain water, provided with appliances to facilitate the passage of the carbonized material from the carbonizing chamber into the gasifying vessel. The volatile matter arising from the treatment of the wood is caused to be discharged at or near the top of the carbonizing chamber, and passes downwardly outside the latter on its way to suitable devices for consuming or treating the volatile products.

Manufacture of Nitric Acid and Ammonium Sulphate.—No. 125,444.

COCKING, A. T., and KYNOCH LTD., of Witton, near Birmingham.

No. 10,852; Aug. 1, 1916.

This invention relates to the manufacture of nitro explosives and ammonia containing fertilizers; the claim made being for an improved method of manufacturing concentrated nitric acid from the atmosphere, together with a yield of ammonium sulphate, comprising: (*a*) The known process of producing ammonium nitrate crystals by means of a combined solid-fuel gas producer and ammonia recovery plant, together with generating plant comprising electric arc furnaces and accessory plant; and (*b*) decomposing the ammonium nitrate crystals by means of sulphuric acid in excess—the mass being heated under reduced pressure.

Extracting Tar Acids or Phenols from Coal Tar. No. 125,445.

HIRD, H. P., of Hipperholme, near Halifax.

No. 10,885; Aug. 2, 1916.

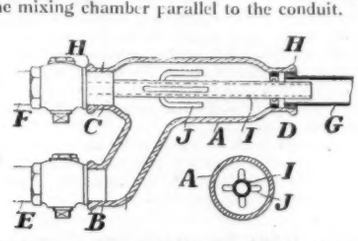
This invention, relating to the distillation or vaporization of coal or wood tar or coal or wood-tar oils, has for its object the cheapening and expediting of the process for extracting tar acids or phenols and the elimination of the operation of washing and agitation of the liquor after treatment by subjecting the vapours distilled off to the action of caustic soda as they pass over the still head. But it has no reference to the discoloring or deodorizing of or the extraction of tar acids from mineral oils by the addition of caustic alkalies to the still, or by causing the vapour from the still to pass over or through alkalies in solution or fused, as has been previously proposed.

Gas-Heating Burners.—No. 125,676.

HALL, I., of Edgbaston, Birmingham.

No. 16,684; May 13, 1918.

The class of burner to which this invention more particularly relates is that in which air is supplied under pressure to a central conduit positioned in an annular mixing chamber which surrounds it, and into which the gas is introduced. The invention is characterized by arranging supplementary air outlets from the central conduit to discharge into the mixing chamber parallel to the conduit.



Hall's Gas-Heating Burner.

The cylindrical chamber A is a single casting with two inlet branches B, C, and an outlet branch D. Bosses constituting the extremities of the branches may be tapped or flanged for the attachment of pipes E, F, G, and strengthened by a circular bead H. The gas inlet is preferably in the same plane as, and adjacent to, the air inlet for convenience in connecting to the respective supplies; and the former is inclined towards the chamber A at such an angle as to allow the gaseous fluid to enter at the rear of the mixing-chamber. The central air conduit I extends the full length of the chamber A and is provided with projecting outlets J whereby a certain proportion of air is discharged into the mixing-chamber at various points in its length. These outlets are formed as tubes bent at right angles to discharge parallel to the main flow, and (advantageously) four are employed, arranged in two pairs—the rearmost pair being at right angles to the other pair. The two members of each pair may have a relative angular spacing of 180°, by which arrangement it is found that "proper admixture is effected with complete and economical combustion."

Gas-Retorts.—No. 126,121.

BANCROFT, F. J., and HANSFORD, J. B., of New Barnet.

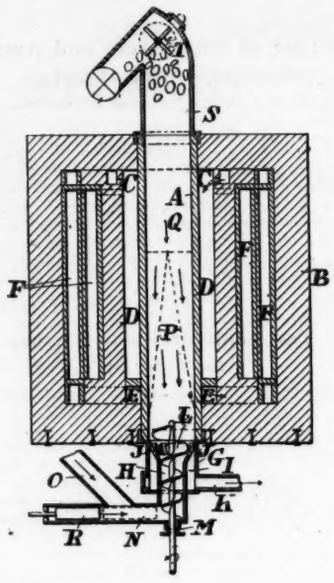
No. 7131; April 27, 1918.

This invention relates to retorts of the continuous or intermittent vertical or inclined type, wherein the coal carbonized is charged into the lower end of the retort, and forced through it in an upward direction by a power-actuated screw conveyor—the gases being drawn off from the lower end of the retort. The object aimed at is to work such retorts so as "to promote high gas, tar, tar oils, and bye-product

yields, and coke of good quality." Definite quantities of oxygen or air, and steam or water are introduced into the top of the retort.

The accompanying illustration is a section of a gas-heated vertical retort arranged according to the invention. The retort casing A (round or of any desired configuration) is arranged in an appropriate setting B carried by girders. It is heated by gas admitted through inlets C in the upper part, into a combustion chamber D surrounding the retort. Products of combustion pass through outlets E into a regenerator F included in the setting.

The retort surmounts a fitting G, which embodies a passage H for the introduction of carbonaceous material into the bottom of the retort and a chamber I encircling the passage and into which gas is drawn down through the material freshly fed in and through the openings J. The evolved gas and other substances are withdrawn from the chamber through the conduit K, which is connected with the fitting G.



Bancroft and Hansford's Gas-Retort.

Any suitable means may be utilized for feeding the carbonaceous material into the bottom of the retort and forcing it upwards. The means indicated diagrammatically in the drawing comprise a rotatable screw conveyer L axially disposed within the chamber H, with its spindle passing through a packing gland M. Extending laterally from H is a passage N, into which the carbonaceous material is fed through a hopper O. When such a conveyor is employed, it is preferable to force the material from the passage N into H, and against the screw blades of the conveyor L, which is done by means of a reciprocating piston or plunger R. The broken lines P indicate the uncarbonized mass of material in the retort—partaking a more or less conical shape—the apex of the cone extending towards the hottest zone Q in the upper part of the retort. The outer portions of the uncarbonized conical mass which are nearest the walls of the heated retort become carbonized first. The hot gases which are drawn off eventually through the conduit K pass down through the uncarbonized mass, and thereby assist in the carbonization.

The retort is provided with a sealed hood S, so arranged that coke delivered or pushed into the head will be automatically discharged; but if desired mechanical means (such as the rotatable arms or blades T) may be provided for extracting the coke.

Generating, from Incandescent Carbonaceous Material, Fuel Gas for Internal-Combustion Engines.—No. 126,140.

PARKER, J. W., of Harrow, and GOLDSMID-ABRAHAMS, E., of The Albany, Piccadilly, W.

No. 7435; May 3, 1918.

This invention relates to the generation of gas for use as fuel in internal combustion engines—more particularly those employed in the propulsion of automobile vehicles, motor boats, and the like, by passing air and steam through an incandescent mass of carbonaceous material (coke or coal) in a gas-generator surmounted by a feed hopper from which the fuel is fed by gravity; the air and water being warmed by the heat generated, and the gas being drawn off from the hottest part of the mass of fuel.

Fig. 1 is a vertical section of one form of the generator, and fig. 2 shows a modified construction.

In fig. 1 the fire-box consists of a vertical cylindrical chamber A (of, or lined with, fire-clay) surmounted by a feed-hopper B for the solid fuel, which, as it gradually burns away within the fire-box, descends by gravity into the latter. The fire-box is surrounded by a jacket-space C to which air is admitted at its bottom at D, and from which the air (warmed by contact with the inner wall of the jacket) enters the fire-box through holes E at the upper end, so as to pass downwards through the solid fuel from above the level where the mass of fuel is kept in a state of incandescence. The bottom of the fire-box is furnished with a fire-grate F, upon which the solid fuel rests, and which surmounts a space closed by a removable ash-pan G.

In the centre of the fire-grate is a small boiler H, having at its upper end a nozzle I for the escape of steam into the mass of incandescent fuel which rests upon the grate, and into which the boiler projects a sufficient distance to ensure its being heated to the requisite temperature. The boiler is fed from beneath, by gravity, with water from a pipe J connected to the vessel K, wherein the water level is kept constant by a float-valve or other device.

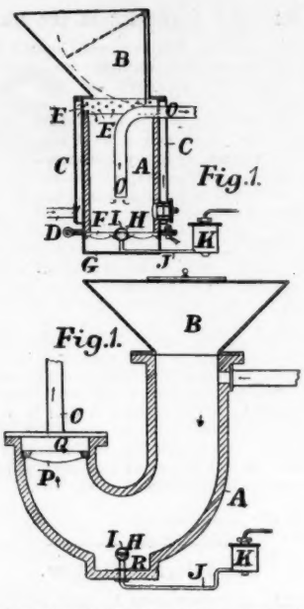


Fig. 1.

Fig. 1.

Parker and Goldsmid-Abrahams' Gas-Generating Plant.

The mass of solid fuel within the fire-box is retained in a state of incandescence for some distance—say about halfway—from the fire-grate upwards; and from a level corresponding substantially with the hottest point, a gas-delivery pipe O leads centrally upwards through the mass of fuel and out through the wall of the fire-box at or near its top.

The hopper B may (and, if the apparatus be worked as a pressure-gas plant, would) be closed at its top, and furnished with a movable internal door for temporarily supporting the mass of fuel within the hopper when the fire-door is opened so as to enable the fire-box to be cleared-out.

In fig. 2 the fire-box consists of an upright tube of J-shape (of, or lined with fire-clay), the longer limb of which is surmounted by the feed-hopper B while the gas-delivery pipe O leads from the top of the shorter limb. A grid P is interposed between the summit-level of the solid fuel in the shorter limb of the tube, and a gas-collecting space Q immediately beneath the inlet of the gas-delivery pipe O; while a small boiler H, fed with water (as in the fig. 1 construction) from a vessel K, is mounted within the lower part of the bend of the J-tube above a recess or chamber R (which may be covered by a fire-grate and furnished with a removable door) projecting beneath the bend and serving as an ash-pan.

The air, which may be caused initially to circulate through a jacket enclosing the J-tube (but not shown) is admitted to the upper end of the longer limb of the latter; and the mass of solid material within the tube is kept in a state of incandescence from the upper end of the shorter limb to a point (say) about half way up in the height of the longer limb. The curvature of the bend, and the length of the shorter limb of the J-tube, should be such as to ensure that this limb is kept filled with fuel owing to the pressure exerted by the mass of material descending gradually in the longer limb, and that the temperature of the mass of incandescent material at its summit-level within the shorter limb shall be maintained substantially equal to the maximum temperature within the fire-box.

Municipalities and the Coal Commission.—At a meeting of the Salford Borough Council last Wednesday, it was agreed, on the proposal of Alderman Phillips (the Chairman of the Gas Committee), seconded by Mr. Lees, to protest against the Coal Commission finishing their work before evidence had been given by consumers. Alderman Phillips pointed out that municipalities were among the largest consumers.

Gas Quality and Output at Portsmouth.—In his report to the Corporation of Portsmouth, Mr. A. A. Moncreaff (the Chief Borough Gas Examiner) states that the calorific value of the gas supplied to the borough by the Portsea Island Gas Light Company varied considerably during the year, but had been much more steady during the latter half of it. So far as purity was concerned, there had been no cause of complaint throughout the year. The pressure also had been maintained; and, on the whole, they had had a better gas supply than during any of the previous war years. The Engineer of the Gas Company (Mr. T. Carmichael) reports a very large increase in the output of gas from the works for this year, as compared with the corresponding period of last year. The increase to date, since Jan. 1, amounts to 80¼ million c.ft., and is equal to 12 p.ct. The increase for the last eight weeks is as high as 16½ p.ct. If the increase continues, even in a modified form, the amount of the extra gas sent out during the year will be far and away the largest with which the Company have ever had to deal.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

The Edinburgh and Leith Corporations' Gas Order Confirmation Bill was read the first and second times.

The following Select Committee has been appointed to consider, among others, the Bournemouth Gas and Water Bill and the Pembroke Gas Bill—to meet on July 1: Duke of Northumberland (Chairman), Viscount Hood, Lord Aberdare, Lord Hindlip, and Lord St. Levan.

The Northampton Gas Bill was read the third time, and passed.

HOUSE OF COMMONS.

Progress of Bills.

The Sunderland Gas Bill was read a second time, and committed.

The Examiners reported that the Standing Orders not previously complied with had now been complied with in the case of the Sheringham Gas and Water Bill and the Newark Gas Bill, which were ordered to be read a second time.

The Ammanford Gas Bill, to authorize the acquisition by the Ammanford Gas Company of the undertaking of the Granant Gas Company, was presented and read the first time. [It was subsequently ordered that the proceedings be null and void.]

Coal Cost and Gas Charges at Malta.

Mr. CAUTLEY asked the Under-Secretary of State for the Colonies whether he would inquire into the action of the Government of Malta in refusing, for some time, to allow the Malta and Mediterranean Gas Company to increase the price of gas at Malta, notwithstanding that coal there had advanced in price £9 per ton from a pre-war price of 23s. 6d. per ton, with the result that the Company had been unable to maintain the moderate dividend of 6 p.ct. which they had paid for over thirty years, or pay any dividend, and had been threatened with a complete loss of profit; and whether he would assist the Company in obtaining compensation for the loss thus inflicted upon them.

Lieut.-Colonel AMERY was not aware of the history of this matter; but he would make further inquiry and communicate the result.

South Metropolitan Gas Company and Sulphate of Ammonia Export Licences.

Sir ALBION RICHARDSON asked the Parliamentary Secretary to the Board of Agriculture whether an arrangement made by his Department, whereby makers of sulphate of ammonia were required to supply this fertilizer for home consumption at a price considerably below its market value on the understanding that the balance not needed for such purpose should be allowed to be exported was not being carried out; whether the South Metropolitan Gas Company, having fully met all the demands made upon them for the home market, now had large and daily increasing stocks, licences for the export of which were obtainable only through the agency of a combination of trade competitors formed with the approval, and receiving the support, of his Department; whether the refusal to give licences without the consent of this agency was inconsistent with the undertaking given by his Department and a breach of faith with the Company; whether the encouragement of the combination referred to was opposed to public policy and calculated to create a monopoly that would prove prejudicial to home users when the present system of control was removed; and whether the necessary steps would be taken to ensure that the Company's applications for licences should be as favourably considered as those made by the members of the combination.

Sir A. BOSCAWEN replied that the arrangement referred to was in continuation of one which had been in operation since the summer of 1917. Continued supervision of the export of sulphate of ammonia was essential if sufficient was to be retained in this country for the urgent needs of home agriculture, and the Board saw no reason for changing a method which had worked well, was perfectly equitable to all makers, and had been accepted unanimously by the Association representing them. So far as the Board were aware, the South Metropolitan Gas Company were the only makers of sulphate of ammonia who had raised any objection. The Board had written to the Company expressing their willingness that export licences should be granted to them on the same terms as to the rest of the makers; but it would not be in the public interest to make exceptional arrangements in their case. The Board did not regard the conditions imposed on the issue of export licences as in any way detrimental to the interests, financial or otherwise, of the Company. As a result of the arrangements with the main body of manufacturers, the market price for export had been stabilized in the interests of all manufacturers of sulphate of ammonia; and the fact that this fertilizer was being supplied during the next four months to home agriculturists at a price below its cost of production indicated that home users, so far from being prejudiced by the arrangements, had been considerably benefited.

HARTLEPOOL GAS AND WATER BILL.

The Unopposed Bills Committee of the House of Commons presided over by Mr. J. H. WHITLEY considered on Tuesday last the Bill promoted by the Hartlepool Gas and Water Company.

Mr. HOOKER (Messrs. Wyatt & Co., Parliamentary Agents) said that the Bill included provision for both the water and the gas undertakings of the Hartlepool Gas and Water Company. So far as gas was concerned, there were a number of clauses which were common to Gas Bills, and with regard to which there was no question. The Company asked for powers to raise £100,000 new capital. There was unissued gas capital to the extent of £141,195; and this, together with a proportion of the new capital, would give the Company gas capital powers amounting to £201,000.

Sir ERNEST MOON, K.C. (the Speaker's Counsel), drew attention to the proposal in the Bill (clause 38) for the redemption of preference and debenture stock by means of a sinking fund, by extending the provisions of the Statutory Companies (Redeemable Stock) Act, 1915, beyond the date of that Act, and applying them to the new capital. He pointed out that this would be paying-off capital by providing a sinking fund taken from profits. No gas or water company had hitherto been granted these powers; and he asked what was the necessity in this case.

Mr. HOOKER said the advisers to the Company regarded the proposal as sound finance from the point of view of the Company and ultimately of the consumer. He could not, however, quote a case in which it had ever been done before.

Sir ERNEST MOON: The effect of it is that you are using profits which you obtain from the consumer to-day for the advantage of consumers in the future. I daresay you know that, in the case of a gas company, this Committee has already refused to grant the power.

Mr. HOOKER agreed, and said that, in order to meet this criticism, he had amended the clause so that it should not apply to gas capital. At the same time, he thought it was the policy of Parliament to allow the powers, as evidenced by the Statutory Companies (Redeemable Stock) Act.

The CHAIRMAN said that his objection to the proposal, in addition to that put forward by Sir Ernest Moon, was that it proposed to amend a Public Act of Parliament by a clause in a Private Act. He did not know why Hartlepool should amend a Public Act.

Mr. HOOKER said that Acts were sometimes amended and adapted for particular undertakings.

Mr. *A. W. Branson*, the General Manager of the Company, remarked that if there was no power to redeem capital, it was a burden on the consumers and on the undertaking.

Sir ERNEST MOON said it was not a question of whether capital should be redeemable, but whether it should be redeemed out of profits or by the re-issue of stock.

Mr. HOOKER asked if the Committee would allow the clause in the Newcastle Bill of 1916 to be inserted. This permitted capital to be redeemable without being redeemable out of a fund provided by profits.

Sir ERNEST MOON: It enables you to redeem by issuing further stock.

The CHAIRMAN: I see no objection to that. With this amendment, the preamble was proved, and the Bill was ordered to be reported for third reading.

STOURPORT GAS BILL.

This Bill was before the Unopposed Bills Committee of the House of Commons presided over by Mr. J. H. WHITLEY last Tuesday.

Mr. PRITCHARD (Messrs. Sharpe, Pritchard, & Co., Parliamentary Agents) said the Bill proposed the incorporation of the Stourport Gas Company as a parliamentary undertaking, with powers to supply gas in the urban district of Stourport and certain adjoining parishes. The Company was established in 1865, and had been supplying gas in Stourport regularly since then, and had recently taken in certain other areas outside the urban district. The Bill included the district of Ombersley within the area of supply; but an agreement had been come to with the Droitwich Rural District Council that if arrangements were come to by the Droitwich Corporation to supply in Ombersley within two years from the passing of the Act, the Company's powers should cease. The nominal capital of the existing Company was £6600; and upon this they were at liberty to pay any dividend they were able to. As a matter of fact, the dividend had been limited to 10 p.ct., although for the past seven years the Company could have paid 16¾ p.ct. on the average. The surplus had always been put into the works, and the accounts for the past ten years showed that £5200 had been spent out of revenue on capital account; while there had also been provided out of revenue the sum of £3400 for working capital—making a total of £8600. The Company had exercised no borrowing powers. The Bill asked that the nominal capital should be converted into £13,200 of 5 p.ct. stock, and also that the existing shareholders should be allotted fully-paid shares to the amount of £6600, which was less than the sum that had been put into the undertaking out of profits. This had been decided by taking a structural value of the undertaking on a pre-war basis; and the amount came to over £20,000. He was told that, had the valuation been made on the present basis, it would have amounted to something like £50,000. Even the District Council agreed that the Company had been exceedingly conservative, and had suggested that they would have thought the value on the pre-war basis would have been about £30,000. The additional capital of £20,000 was, when the Bill was introduced, anticipated to last for twelve or fifteen years; but it was not now expected to last for more than eight or ten years, as a very large order had just been received from a motor cycle factory and a general engineering works.

The CHAIRMAN asked if an electric power station was to be erected at Stourport by the Power Company.

Mr. PRITCHARD said it was. The Gas Company hoped it would come along, because it was anticipated that it would increase business. He added that the standard price was 4s. 6d. per 1000 c.ft. within one mile of the gas-works and 5s. beyond. The present charge was 4s. 10d. It was feared, however, that it would have to be increased in the immediate future; but it was hoped that this would be the last increase. Before the war, the Company was able easily to supply at 4s. 6d.

Mr. *A. S. Foster*, the Engineer and Manager of the Company, said that pre-war the Company's coal came from near Wrexham; but under the coal reorganization scheme they now had to obtain it from South Yorkshire. This coal, however, was much worse for gas-making purposes.

Mr. *G. Stevenson*, Consulting Engineer to the Company, said he had prepared the valuation of the undertaking referred to, and it worked out to £748 per million of the previous year's output, which was very much less than the average of works of this size.

The preamble of the Bill was proved; and it was ordered to be reported for third reading.

MISCELLANEOUS NEWS.

THE COAL INDUSTRY COMMISSION.

A Scheme of Co-Partnership for the Coal Industry outlined by Mr. William Cash.

On Friday, the 30th ult., Mr. WILLIAM CASH was called to give evidence. He said he had had thirty years' general experience as an accountant, particularly in connection with gas and water undertakings. He was very familiar with the Statute Law governing the supply of gas and water, and had some knowledge of electric light and tramways legislation. He was a member of the Executive of the National Gas Council, and was the Employers' Representative on the Gas Industrial Council which had just recently been formed. From his close connection with the gas industry, he was deeply concerned in the problems now being considered by the Commission, particularly as the decisions of the Commissioners might affect the supply of coal, on which the gas industry depended. He was not, however, commissioned by the gas industry to speak on their behalf, nor was he expressing the views of any other organized body of persons.

He had given some consideration to the question of nationalization of the coal industry; and he ventured to put forward such information as he possessed in the hope that it might be worthy of consideration by the Commission as a solution of the problem as to what conditions should be applied to the conduct of the industry in future in the interest of the community, the miners, and the coalowners. In his opinion, a parallel case existed between the supply of water, gas, and electricity and the supply of coal. The Legislature had provided that the first three should be dealt with on the lines of a regulated monopoly. The supply of all three commodities was in the hands of both companies and local authorities; but many of the undertakings now conducted by the latter were commenced by private undertakers and had been subsequently transferred to the local authorities by purchase on terms sanctioned by Parliament. He thought the conditions existing with regard to gas would be most helpful if the Commission should be of opinion that similar conditions might be applied to the coal industry.

In 1845, the Companies Clauses Consolidation Act was passed, which in one complete form dealt with the whole law relating to all companies thereafter incorporated by Act of Parliament for the purpose of carrying on any undertaking. The Act, with certain exceptions and modifications, was incorporated in the Special Act of every gas and water company; and therefore every statutory gas or water company was exempt from the provisions of the Companies Act, 1908, or the preceding Act relating to limited companies. The earliest legislation with regard to water companies was the Water-Works Clauses Act, 1847. This Act defined and limited the amount of capital to be employed, and made general provisions as to the way in which the business was to be carried on. It was the practice of Parliament in authorizing the creation of capital for both gas and water undertakings to limit the amount from time to time granted to such an amount as would meet the likely requirements for such period as would bring the undertakers again before Parliament for a review of their stewardship every twelve or fifteen years. A statutory gas undertaking had a virtual monopoly in the sense that Parliament did not grant overlapping powers to companies or authorities; but it was a regulated authority within the assigned district. There had been a few cases in recent sessions since 1905 where Parliament had entrusted electricity powers to statutory gas companies.

Under the provisions of the Gas-Works Clauses Act, 1847, which was the main statute or charter under which a gas company carried on its business, the profit to be divided among the shareholders was limited to 10 p.ct. on the paid-up capital, with power to make-up any deficiency of dividend out of future profits, and with the obligation to accumulate as a reserve fund any surplus profits to an amount not exceeding one-tenth of the nominal capital. This reserve fund was also available to meet any extraordinary claim or demand. When the reserve fund reached its limit, the undertakers were required to apply any surplus profits in the reduction of the price of gas. Combined with a maximum dividend to the shareholder, each Special Act contained a maximum price to be charged for the gas supplied.

In 1875 a system of sliding scale in the price of gas and dividend was first introduced in London, and had since then been very widely adopted. The basis of the principle was that a reduction or increase in the price of gas was followed by an increase or reduction in the dividend payable. The consumer and the shareholder thus became, in a sense, partners in the business; and an inducement was thereby offered to the company to conduct its business on the most approved and up-to-date lines to obtain the best working results. Two years later the auction clauses were introduced in Gas Bills. By this enactment all future additional capital had to be offered publicly by auction or tender to the highest bidder. The premiums obtained were treated as capital and carried no dividend. Large sums of capital had been raised by these means on the most advantageous terms obtainable. In the eight years, 1899 to 1908, about eight millions of capital were raised by various statutory companies, and premiums received to an extent of approximately £1,450,000. The consequent cost of capital in the shape of interest or dividend had been kept as low as possible; and the consumer had received the benefit in the lessened price of gas. In fixing the standard price for a company adopting the sliding-scale, the past records, as to cost of manufacture and the dividends paid, had been investigated. Once fixed, Parliament had not thereafter amended the bargain, except for some other alteration simultaneously effected—such as lowering the prescribed illuminating value of the gas supplied. Attempts had been made from time to time to induce the Legislature to alter the bargain, which companies had always strenuously resisted, and rightly so. The existing capital had been raised under certain conditions; and although the bargain might—through good management or modern developments—have resulted in a greater benefit in dividend than was originally expected, the partnership was continuing, and the consumer had received in reduction of price his full share of the advantage. The general basis of slide had been 5s. p.ct. on 10 p.ct. capital for each penny in the price of gas. On converted capital of 5-p.ct. the dividend variation had been 2s. 6d. p.ct., and in some cases 3s. 6d. when applied to 7 p.ct. additional capital. With the introduction of the sliding-scale, the old limited reserve was done away with; and in its place a fund with no limitations (built-up out of divisible profits only) was introduced. This meant that the shareholders might, out of their share of the profits, lay aside such sum as they thought fit. The sliding-scale companies were allowed an insurance fund; the annual contribution being limited to 1 p.ct. on the capital, and the total to 5 p.ct. on the capital. After 1908, the insurance and renewal funds were amalgamated into one fund, called the Special Purposes Fund; the contribution being 1 p.ct. per annum, and the limit 10 p.ct. on the paid-up capital, including premiums.

Witness next drew attention to the principle of co-partnership recently adopted, whereby the workpeople and staffs of many of the larger companies had been given a share in the prosperity of the undertakings. This plan was first introduced in gas companies by the late Sir George Livesey, in 1890, at the South Metropolitan Gas-Works. Although the terms varied with the different companies, the broad basis was identical. The employees received a bonus calculated by way of percentage on the individual wages paid, and rising or falling by (say) one-half or one-quarter p.ct. for each decrease or increase of 1d. in the price of gas ruling during the twelve months current. This bonus was placed to the credit of the employees, and was used in whole or in part for the acquisition of stock or shares in the undertaking. Co-partners were admitted after a period of probation, and signed an agreement of service.

The results had, of course, been seriously affected by the war. In 1913, 33 companies divided £140,107—the lowest amount being 4 p.ct. and the highest 8 p.ct. Educational and training work was now being undertaken by certain companies—lectures being given for employees on the process of manufacture, the art of salesmanship, and the best appliances for the consumers.

The war had had a serious effect on gas undertakings; the increased cost of coal and labour had materially raised the cost of production, which in turn had its effect upon the price charged. In this way the dividends on nearly all gas shares had been reduced. A gas company could not profiteer. It was compelled to pass on to the consumer the increase in cost, which it could not control. As a further consequence, the share of profits or bonus to co-partners had disappeared. In two companies with which he was connected the directors had amended the schemes by giving a minimum bonus of 4 p.ct. on wages; at the same time inaugurating a pension fund, applying the bulk of the bonus to pay the men's contribution. Both these companies were now in consultation with their men on the question of revising the co-partnership scheme to fit in with the Works Committees now in course of formation under the Whitley Scheme of Councils. Personally, he hoped the functions of these Committees would be extended from consultative measures on management, wages, &c., to recreation and housing. These schemes recognized in full the men's rights to organization by Trade Unions; and, as outlined by the Ministry of Labour, they would safeguard decisions arrived at on a national basis relating to such matters as hours of labour.

He thought a similar arrangement could be applied to the coal industry. Coal was a national and universal necessity, and like gas in a sense, similarly qualified, a monopoly. He would suggest in outline the principles that might be applied. It should be provided by a General Act of Parliament that no one should engage in coal mining for the sale of coal without the authority of an Order. It would not be possible for Parliament under the present methods of Private Bill Legislation to institute the necessary inquiries to settle the conditions applicable to each colliery undertaking. He would suggest the setting-up of Coal Commissioners, to settle the terms of the Order to be granted to each undertaking. He would take, as the basis for the formation of such a Board, the recommendations of the Committee appointed by the Board of Trade in their report of April 29, 1918, relating to electric power supply. Under the powers proposed, the Commissioners would be enabled to fix a standard dividend for the ordinary capital, the amount of the capital, and the standard selling price for the coal—regard being had in each case to the past history and capabilities of the particular colliery. Based on these two standards, every reduction in the price realized for the coal would entitle the undertaking to distribute to the proprietors and the workpeople out of profits or reserve, so far as available, a relatively increased dividend. Conversely every increase in the price realized above the standard would involve a relative reduction in the dividend and bonus. Though he could not suggest the relative slide, he thought that a basis should be found so as to provide a real inducement to reduce prices. Further regulations would fix the limits of the reserve for: (*a*) Equalization of dividends; (*b*) accidents; (*c*) special renewals; (*d*) amortization of leaseholds or property of a wasting character. He further suggested that a proportion of the profits—also dependent on the price realized for coal—should be allocated as a bonus, on co-partnership lines, to the workpeople and officials, and payable as a percentage on wages and salaries. All this would tend to unite the management and the workpeople in a common object, to reduce the costs and the selling price, and increase the profits—thus creating a true co-partnership between the proprietors, the workpeople, and the public. Standardized accounts should be obligatory, and should contain statistical information as to the coal raised, the wagons owned, and any other necessary information.

As a guide, he would mention the forms prescribed for gas companies, electric light companies, and the most recent form of railway accounts as laid down under the Railway Companies (Accounts and Returns) Act, 1911. The main heads would, *inter alia*, state amount of wages paid, cost of materials used, cost of repairs and upkeep, administration, rents and repairs of cottage properties, and royalties. Coal statistics should show tons of coal raised and coal applied for colliery use and supplied free to workpeople. The coal industry, having a simple and convenient unit of tons, lent itself admirably to statistical record in the matter of costs and easy comparison of working results. These accounts should be filed with the Coal Commissioners, and should also be available for inspection by all persons interested.

The Commissioners might also be given plenary powers to fix all future royalties in respect of undeveloped coal. There would be no necessity to go to the expense of re-incorporation. Re-incorporation had been the practice with regard to non-statutory gas companies applying for Private Acts. The procedure of the Coal Commissioners would follow the methods of the Board of Trade in granting Provisional Orders to undertakers, both companies and private individuals, under the provisions of the Gas and Water Facilities Acts, 1870 and 1873. These Orders required the confirmation of Parliament; but he suggested that this should not be requisite in the case of collieries. His personal opinion was not in favour of nationalization; but procedure on the above lines would materially assist subsequent action for nationalization if this were decided upon hereafter. The accounts suggested would afford all the necessary information as to profits, costs, &c.; and the regulation of the industry would limit the expansion of profits to an undue extent. The formation of Works Committees, the sharing of profits, the acquisition of shares in the undertaking, and the knowledge of working results, he believed would go a long way to meet the present suspicion and dissatisfaction felt by workpeople.

In the case of a few gas companies, Parliament had sanctioned the creation of benefit funds for workpeople, limiting the amount so expended to a sum calculated on the sale of gas. Special provision had been made in certain Private Acts simplifying the transfer and transmission on death of workmen's share-holdings; and a Bill was at present before Parliament by which leave was asked to expend money in housing schemes. In a few companies, there were provisions for working-men directors where profit-sharing schemes were in operation. The issue of capital direct to workpeople had also been recognized. With regard to future capital, he thought legislation on the above lines would attract it. The method of requiring gas and water companies to raise a substantial portion of their capital by loan or mortgage, at a fixed and limited rate of interest, had a most beneficial effect, as it insured cheap capital, which was for the benefit of the shareholder and the consumer.

Speaking generally, he did not think municipal undertakings were as efficiently conducted as those privately owned, though of course there were exceptions. There was not the same opportunity of obtaining special recognition of exceptional services. In Government Departments it was always difficult to get at the head man who was in a position to settle anything finally; and in his experience there was a tendency to avoid responsibility, for fear of making a mistake or incurring censure. The shareholders' meeting, and the rate of dividend, were a spur to the responsible officials in private undertakings. There could be no similar review of operations under bureaucratic control. Under national control, all competition would be eliminated, which would be most disastrous. With regard to unprofitable coalfields, it might be possible to raise a development fund by a levy at a rate per ton on the coal raised within defined areas for their development.

Parliament had sanctioned the transfer of gas and water undertakings to local authorities by compulsory purchase; the price being settled by arbitration. Broadly speaking, the procedure was to ascertain a maintainable revenue capable of being distributed within the limits fixed by the Act of Parliament, and to multiply this by the number of years' purchase, adding thereto a sum for disturbance by reason of compulsion, to cover the cost of re-investment and the temporary loss of interest. The number of years' purchase was determined by the relative value of other like securities. He suggested that similar conditions might apply to the coal industry. It was usual to provide compensation to directors for loss of office, and to managers, engineers, and officers displaced, if not taken over. In the transfer of a colliery by purchase, special regard would have to be had to the remaining life of the coalfields acquired, and the profits adjusted to allow for exhaustion at the date appropriate in each case.

Under the Metropolis Water Act, 1902, eight London Water Companies were transferred to the Metropolitan Water Board. The terms of payment were settled by an arbitration—the awards and costs amounting to about 47½ million pounds. In the case of the West Middlesex Company, the sum awarded was equal to 38 years' purchase of the statutory dividend. In the case of the Port of London Authority, which took over the London Docks under the Port of London Act, 1908, the sum payable was £22,350,000. The terms included compensation to the directors of the three dock companies, amounting to a sum of £127,600 (payable in "A" stock) and also compensation to officers under certain circumstances and conditions.

By Sir ARTHUR DUCKHAM: He did not see that the fact that the supply of gas was more or less kept in one area affected the position. His suggestion would be that, in fixing a standard price for each coal undertaking, regard should be had by the authority settling the terms of the Order to the circumstances (in connection with each undertaking) of its past history, just as was done when a gas company had come to Parliament for incorporation. When a colliery produced five or six different classes of coal, the average cost should be taken, and the standard based on the price realized. He should be very sorry to see a standard price which was subject to continual variation, as this would destroy a great deal of the incentive.

Sir ARTHUR DUCKHAM: The ideal you have put before us is that the capitalist on the financial side and the workpeople and the consumer are all partners?

Witness agreed. He had written his notes before the Coalowners' Scheme was laid before the Commission; and the essential difference was that in his scheme he brought in the consumer. He was more concerned with the consumers' position than with that of the colliery owners. The consumers wanted cheap coal, and plenty of it. The South Metropolitan Gas Company, which started the co-partnership scheme, had two workmen directors sitting on the Board. This was followed by the South Suburban Gas Company, and they spoke very highly of the advantages derived thereby. Although at the present moment the bonus had been depleted, owing to the rise in all costs, they were very enthusiastic as to the advantages which would be gained by co-operation, and from consultation with their men. He was connected with two companies where the co-partnership scheme was worked; and he could endorse these sentiments. If the workpeople became substantial shareholders, they were entitled to representation on the Board. Similarly, if the workmen were profit-sharers, they were interested in the finances of the company; and that entitled them to become directors. He thought they were entitled to have a voice in consultation with the management on general questions of the conduct of the business.

By Mr. SIDNEY WEBB: He put coal to some extent on a parallel with gas, water, and electricity. With regard to coal, he thought there was a case for control as distinguished from nationalization, on the ground that it was a necessity and practically a monopoly. He was in favour of competition as between one undertaking and another, provided that the consumer got his fair share of the profits that were made. He should like to see a standard price which gave an inducement to everybody concerned to reduce prices. With regard to collieries producing a number of different qualities of coal, he saw no greater difficulty in fixing a standard price than doing so for gas companies, which varied in almost every undertaking throughout the kingdom. The particular circumstances of every gas company—whether supplied by rail-borne coal, sea-borne coal, or whether they were close to a coalfield or otherwise—would give rise to the same difficulty. He suggested that there should be a standard price for each colliery undertaking. Asked as to whether the middleman could be relied upon to pass on to the consumer any reduction made in the price of coal, witness said that personally he should be rather in favour of some regulation with regard to the retail trade, whereby the retailer should be bound to state how his price was made up.

FURTHER WITNESSES FOR THE GAS INDUSTRY.

The last two witnesses called before the Commission last Thursday evening were Mr. D. Milne Watson, the President of the National Gas Council, and Governor of the Gas Light and Coke Company, and Mr. A. E. Broadberry, the Chief Engineer and General Manager of the Tottenham District Light, Heat, and Power Company, Member of the Institution of Civil Engineers, and Past President of the Institution of Gas Engineers.

Precis of the Evidence of Mr. D. Milne Watson.

Mr. D. Milne Watson stated that he had been asked to appear before the Commission and did so in a dual capacity—first as President of the National Gas Council (a body comprising the great majority of the gas undertakings in the country) and secondly as Governor of the Gas Light and Coke Company, the largest gas undertaking in the country and probably in the world.

He understood that the Commissioners desired to hear generally the views of the gas industry on the question of the nationalization of the coal mines of the country. The gas industry, he believed, is the second largest buyer of coal in the United Kingdom—using annually some 20 million tons of coal, being even larger users than the railway companies. Its views, therefore, are entitled to consideration.

He wished to bring before the Coal Commission the following resolution, which was recently passed at a meeting of the Central Executive Board of the National Gas Council:

> "That the gas industry, which is one of the largest consumers of coal in the kingdom (carbonizing some 20 million tons of coal annually) and has wide experience of the coal market ranging over many years, views with serious alarm the proposals for nationalization of the coal mines, and is of the opinion that this would neither engender a spirit of efficiency in the collieries nor effect national economy."

From this it would be seen that the gas industry is wholly opposed to the nationalization of the coal mines.

Witness's Company is one of the largest individual buyers of coal in the country—purchasing some 2 million tons of coal annually. He has himself been responsible for buying coal for the Company over a large number of years; and, therefore, he was speaking from his own personal experience.

Before the war coal was either bought directly from the collieries, in the case of the larger undertakings, without the intervention of middlemen, or through merchants. The latter method of purchasing coal was the usual one in the case of the smaller undertakings, but also, to a certain extent, was employed by the larger undertakings. In his Company some 440,000 tons were usually bought from merchants—that is to say, 22 p.ct.

Merchants were he considered a convenience in a certain class of business. It was quite impossible for the collieries to send a representative to each of the gas undertakings, and it was equally impossible for the small gas undertakings to send direct to the collieries. Merchants were thus necessary to the carrying on of the trade; and generally speaking they gave satisfaction. In the case of large contracts, the merchants' remuneration was occasionally not more than 1d. per ton; and 2d. was a very usual figure. Witness did not think this work could be done any cheaper or more efficiently by any other body of men.

The gas industry objected to nationalization because it was, on the whole, quite satisfied with the method of purchasing coal which prevailed in pre-war times, and because it does not believe that nationalization would work satisfactorily.

The industry has had large experience of control during the war; and, while admitting that this was necessary, and always will be necessary during periods such as we have just passed through, it does not believe that control in the form of nationalization is required in normal times for the protection of the public. Indeed, it is thought that the public would undoubtedly suffer.

Allowing for the fact that the state of affairs in the coal trade was quite abnormal during the war, yet the Government control undoubtedly gave us a foretaste of what might be expected under a system of nationalization. Gas-works have had to take unsuitable coal—sometimes coal that was not gas coal at all, and sometimes gas coal that was not suitable for the particular works to which it was sent. This has caused great waste, and corresponding financial loss. Only bituminous coal can be used advantageously for gas making; and more-

over all grades of what is commonly known as "gas coal" are not suitable for every gas-works. This is a point of great importance which has been largely lost sight of under the system of Government control.

Referring to the Coal Transport Re-organization Scheme, it is realized that the endeavour to save train mileage was done with the best intentions; nevertheless the effect was in many cases most serious.

It seemed difficult for Government officials to understand that if coal has to be sent a long way, it is better to send only the best coal. In a journey of say 150 miles, it is better to add 20 or 30 miles train haulage, in order to send really suitable coal. Innumerable instances exist of coal being sent despite the protests of the users. Witness's own Company had to complain from time to time about coal containing up to 30 p.ct. of ash being sent all the way to London. Such coal ought to have been used as near the pit as possible, in order to avoid the waste caused by sending 30 p.ct. of ash long distances. In other words, when such coal was forwarded, one in every three wagons was, to all intents and purposes, useless.

Government control has also meant that we have been subjected to entirely arbitrary decisions in the question of price. Witness quite realized that the effect of the control had been to keep the price within limits; and it is desirable that this should be done. At the same time, in the future this can be achieved by other means than nationalization. Why should not the coal industry be dealt with much in the same way as the gas undertakings, which have a partial monopoly? Why should not legislation be passed giving power to the Government to appoint auditors to see that the prices charged are only such as will give a fair return to the colliery owner—due allowance being made for dedelopment, depreciation, &c.? This has been done in the gas industry, in which approximately 150 millions of capital is invested.

Witness was of opinion that there is no necessity to nationalize the mines in order to improve the conditions of the miners. Legislation can be passed dealing with wages, proper housing, and other improvements, without nationalization.

It is felt that nationalization would put the purchaser of coal entirely in the hands of Government officials. If coal was nationalized, there would, of course, be no competition. Experience gained during control is that we are not likely to get as much consideration from an industry which would be a Government monopoly as from keen business men in competition with one another. Pre-war experience was that if one colliery sent unsuitable coal, the Company could go to another. This made the seller considerate of the customer's interests, both as regards price and quality. If there were only one seller, there would be very little attempt to please the customer, because he would not be able to go elsewhere. The price might be increased excessively for the purpose of getting revenue for the State; and supposing the unfortunate gas undertaking would not pay the price, and tried to get its coal elsewhere, the only other source would be from abroad, and nothing would be easier than for the Government to refuse to allow the importation of coal, and in this way force the consumer to pay the price demanded.

Witness did not propose to go into the political aspect of the question, though it was a serious one. He does not think that monopolies are beneficial to the public as a whole. It is much more healthy that there should be competition for business, instead of the "take it or leave it" attitude which seems inherent to monopoly, of which a nationalized coal industry would be a gigantic example.

Witness wished to point out that the gas industry furnishes an example of the effect of healthy competition on an industry. It was frequently said in the old days that gas undertakings were very independent; but the advent of electricity altered all that. Gas undertakings were put on their mettle, and had to adopt a more business-like and conciliatory attitude to their customers, and make an effort not only to get new business but to retain old. This was greatly to the advantage of the public.

A great deal had been said in regard to the saving of expense by an industry being run by the Government; but in witness's opinion this is not likely to be the case as far as the coal industry is concerned.

Witness wished to point out that if the businesses of the various users of coal were not to be seriously injured, it was imperative to study the requirements of each individual user, whether he be a user of steam, gas, or house coal; and it would be necessary to keep a large number of officials to sell and allocate the various descriptions and grades of coal. The conduct of such a gigantic monopoly as the coal industry would involve the employment of an army of officials, who would have no direct interest in pleasing customers.

Witness thought that the Government should leave the industry to carry on its own business, but establish an efficient financial control with regard to profits, wages, housing, &c. This could be done at comparatively small cost; and it would abolish the chief grievance the purchaser has experienced occasionally in the past—viz., the sudden and considerable rise in the price of coal brought about by an increased demand from abroad.

He considered that the nation would, in the way indicated, get the benefits of individual enterprise, efficiency, and initiative, in conjunction with effective Government control.

MR. BROADBERRY'S EVIDENCE.

Mr. BROADBERRY said he had had forty years' experience in gas manufacture. For twenty years he had had chief control of the Tottenham gas undertaking—a Company using 160,000 tons of coal per annum for coal gas manufacture, or about the one-hundredth part of the whole quantity used in the country. It was essential to successful and efficient working that absolutely suitable coals should be obtained. This requirement is only likely to be met by competition and free choice of selection. Apart from price, which is a commercial rather than a technical matter, there are many points of consideration which can best be met by free choice and competition.

As to suitability and class of coal, it should be remembered that anthracite, semi-anthracite, cannels, hybrid cannels, hard steam, and non-coking coals generally are unsuitable. Clean bituminous coking coal, giving a good yield of gas, a low sulphur content, a strong coke, and prolific tar and ammonia is best suited to good working, and consequent economy in the coal used. Cleanliness—that is freedom from ash—is very desirable. During the period of control, many samples tested have shown over 20 p.ct. of ash and some over 30 p.ct. The highest, 64·97 p.ct., was very exceptional, as was also the lowest, 1·32 p.ct.

Provided the coal is otherwise good, the yield of gas, tar, and ammonia is reduced in proportion to the ash content. The effect on the coke, however, is disastrous. All the ash remains in the coke; and as the coke produced weighs about two-thirds the original weight of the coal, 20 p.ct. of ash in coal means 30 p.ct. of ash in the resulting coke. Such coke is not only inefficient as a fuel in proportion to its ash, but it causes the employment of extra labour for incessant clinkering, reduces the efficiency of boilers, and the dirt which has already unnecessarily added to the railway costs for carriage forms 4 cwt. of clinker for every ton of coal carbonized, and this has to be carted away to some shoot near or far. Proper cleaning of the coal therefore is of national interest, and can only be obtained by promoting competition between the collieries.

Another factor in the economical use of coal which is of an importance quite as great as cleanliness, is suitability. A coal may be very clean, but at the same time altogether unsuitable for gas-making. Even if suitable for one class or type of gas-making plant, a coal may be unsuitable for another. Each type has characteristic variations as to its requirements. Individual selection and freedom of choice are therefore desirable, and indeed essential to efficient working.

During the last accounting period before the war his Company's make of gas was 13,148 c.ft. per ton. During the last accounting period, to December, 1918, the make was 11,425 c.ft. per ton; and this was mostly due to unsuitable coal. On these figures, if they could have worked to pre-war efficiency they would have used over 13 p.ct. less coal; and if their working was typical of the other 99 p.ct of producers, the coal wasted in twelve months due to unsuitable coals now that the companies had no free choice amounted to 2,080,000 tons per annum.

Bearing on this question of unsuitability, it was worth recording that three years ago witness toured South Yorkshire in search of good gas coal; and on calling at one colliery he was fortunate in meeting the managing director of the next colliery (some miles away) which he intended visiting and was saved the time and trouble of going there by the managing director telling him they did not raise an ounce of coal suitable for gas making, but only steam hards. Nevertheless thousands of tons of coal were being sent to them for gas manufacture from this particular colliery. There was no national economy in such arrangements. If freedom of choice existed, no more would come from that source.

Another important consideration in selecting the particular colliery from which to secure supplies was the question of equity of weight. Some collieries regularly sent good full weight, and others were just the reverse. Competition was the only corrective in this matter.

Yet another matter of great importance was the regularity and reliability of consignments. It made all the difference to economy of working whether or not supplies came in a steady stream or whether a glut of deliveries came in and had to be put to stock, to be followed by a scarcity which necessitated picking it all up again. The highest and lowest stocks at Tottenham in various years were:

	1916	1917	1918
Highest ...	tons 45,000	59,000	56,000
Lowest ...	tons 5,000	29,500	4,800

This represented a great waste of labour which could have been largely avoided by direct arrangement between the user and supplier when the latter had the fear of competition from rival collieries.

Coventry Gas-Works Accounts.—The Coventry Corporation gas undertaking annual accounts show a profit for the year of £12,673, as compared with £23,249 for the previous year. The Committee recommend that £5000 be paid in relief of the rates, and the balance carried forward.

Municipal Employees' Demands.—At a meeting of the Bury Town Council last Thursday, a letter was read from the Municipal Employees' Association, asking that a 47-hour week should be adopted pending the national conference on hours, in preference to the 48-hour week adopted by the Lancashire and Cheshire Conference of local authorities. Alderman Kay moved that no action be taken at present, because they were pledged to pay the standard rate of wages and observe the usual hours. Mr. Noble asked if they were not members of the Lancashire and Cheshire Conference, and, being answered in the affirmative, said it was no use being members of any particular body and then going beyond it. The Council, after further discussion, decided to abide by the decision of the conference on the 48-hour week.

Profit Disposal at Barrow.—The Barrow Town Council last Monday week decided that each member should be supplied with a copy report of the Manager (Mr. F. Chadderton) and the financial statement for the past year, in order that he might be prepared to consider the question of the price of gas. Mr. Whinnerah asserted that the Gas Committee were proposing to place £9482 out of the profit of the gas-works to the reserve fund. During the year £3000 was spent on renewals, so that there was a profit of £12,500. The price of gas to consumers at present was 4s. 6d. per 1000 c.ft., but the average price for last year was 4s. 3d. and yet there was a proposal to create a show-room and appoint a canvasser to advise on the use and keeping in order of gas appliances. If they reduced the price of gas, the consumption would increase without any canvassing; and it was not right to extract profit from gas consumers for the reduction of the rates of people who did not use gas. Mr. Archer said the report showed that in the last twelve months there had been more gas produced per ton of coal carbonized than in the previous year; but there was a big loss of gas. Mr. Shyvers said that Mr. Whinnerah had not given a word of credit to the Manager for the excellent results he had obtained under adverse conditions. After further discussion it was agreed to defer the question of reduction until the next meeting. Mr. Chadderton's report for the year showed that there was a slight decrease in the consumption of gas; the total make being nearly 385 million c.ft. of coal gas and 54 million c.ft. of carburetted water gas.

FUEL RATIONING AND COAL OUTPUT.

A Serious Position.

Replying to a question in the House of Commons last Wednesday, as to the position of the coal industry following on the shortening of the working-hour day, the President of the Board of Trade (Sir Auckland Geddes) said he regretted to have to inform the House that the coal position was serious. So far as it was possible to judge, after taking into account the latest information available, the estimated output of coal for twelve months from July, 1919, after the reduced hours had come into force, was between 214 and 217 million tons per annum. This compared with a pre-war output in the year 1913 of 287 million tons. The consumption of coal for inland purposes and bunkers, which was for the year 1913 210 million tons, had fallen to 196 million tons for the year 1918. The exports of coal in the year 1913 were 77 million tons, and in the year 1918 34 million tons. In order to preserve, approximately, the same quantity of coal for inland consumption and bunkers for twelve months from July, 1919, all present restrictions on consumption must be fully maintained, and, in addition, exports must be reduced from a rate of 34 million tons to 23 million tons per annum. It is calculated that the deficiency on the working of the industry on the basis of the estimated outputs given for the period of twelve months from July next, after providing for the guaranteed profits to owners at the rate of 1s. 2d. per ton, would be about £46,600,000, equal to 4s. 3d. per ton of output. This meant either an increase of price to the consumer of about 4s. 6d. per ton, or that the deficiency would fall on the taxpayer.

As to the future of rationing, he said that, although the quantity of coal available for inland consumption and bunkers would be no more than in 1918, the Controller of Coal Mines hoped to introduce modifications in the present system to the extent that all consumers of below 5 tons per annum of coal, 12,500 c.ft. of gas per quarter, and 400 units per quarter of electricity would be exempt from rationing. It was proposed that above these limits the present assessments should continue in force for another twelve months from July 1, and that consumers would be allowed between July 1 and Sept. 30 to stock up to their present assessments so far as the coal might be available. It was also under consideration to modify to some extent the present transport reorganization scheme with a view to giving it greater elasticity.

From a lengthy official memorandum on the output of coal which was submitted to the members of the Coal Commission on the same day, the following figures have been taken:

The output for the first twenty weeks of 1919 was at the rate of 242 million tons per annum, as compared with 287 million tons in 1913. The average number of men employed during the twenty weeks of 1919 was 1,111,000, being exactly the same number as the average employed during the year 1913. The average weekly output for the four weeks ended May 24, 1919, during which period there were no holidays and few stoppages, was 4,813,000 tons, or at the rate of (say) 238 million tons per annum after allowing 5 p.ct. for holidays and stoppages. The average weekly output of the six weeks ending March 15, during which conditions were fairly normal (with no holidays and few strikes or stoppages), the average output for the four weeks ending May 24, when similar conditions prevailed and the Sankey wage was in operation, and the average number of persons employed in the respective periods, are:

—	Six Weeks Ending March 15.	Four Weeks Ending May 24.
Average number of persons employed	1,081,000	1,124,000
Average output per week	4,852,000	4,813,000
Output per man per week	4·5	4·3
Output per actual man shift	0·92	0·90

Manufacture of Hydrogen.

In the Patents Court which has been dealing with the patents of alien enemies, Messrs. Samuel Cutler & Sons, Ltd., last Wednesday, applied for licences to manufacture under three Messerschmitt patents for the production of hydrogen—Nos. 12,117 of 1912, 17,690 of 1913, and 18,942 of 1913. Mr. Tennant explained that the first patent related to re-inforced spongey iron, the active agent in the production of hydrogen. He suggested a royalty of 6d. per ton on the spongey iron used. The other patents related to the production of hydrogen in accordance with the iron reaction process, in which gas of a high calorific power was used for reduction and gas of a low calorific power for heating. The firm had applied before for licences to use German patents in connection with these processes; and in those cases they had proposed to pay a royalty on the total cost of the plant. He thought these patents should go into the royalty arrangement. Mr. Temple Franks (the Controller of Patents) said the application would be favourably entertained.

Messrs. A. & W. Richards advertise the sale by auction next Tuesday, at the Cannon Street Hotel, of £25,000 of 6 p.ct. redeemable preference stock in the Brighton and Hove General Gas Company. The stock is to be redeemed at par at the end of seven years.

The following curious paragraph is taken from a recent issue of the "Sussex Daily News:" Three weeks ago, at Chatham, the Kent Coroner strongly recommended a man to remove a gas-cooker from the house, because of the fatal fascination it had for members of his family; two of his brothers having committed suicide by gas poisoning. He disregarded the Coroner's advice, and yesterday was found dead with his head in the oven. All three brothers used the same cushion.

GAS-WORKS EXTENSIONS AT MANCHESTER.

The Manchester City Council, at their meeting last Wednesday, had before them for consideration the proposal of the Gas Committee to borrow the sum of £595,000 for the purpose of extending the plant at the different gas-works—mainly at Bradford Road. The total cost of the extensions is estimated at £921,000, as stated in the "JOURNAL" last week; but the amount for which borrowing power was sought was £595,000.

In the report of the Gas Committee which was put before the Council, it was pointed out that the highly efficient appliances now available for the economical use of gas will bring about its more general adoption for both manufacturing and domestic purposes; and it is argued that the carrying-out of the new housing schemes, coupled with the demand for greater conveniences and better conditions in the home, cannot fail to stimulate the use of gas for heating and cooking. To furnish the needs of existing consumers, and to be prepared to meet the increased demand as it arises, the proposed new plant is required almost immediately. A statement of the financial position of the gas undertaking as a whole shows that its assets now exceed liabilities by £2,497,717. The new expenditure on the manufacturing plant will be spread over three or four years; and the sum of £210,000 which is required for distribution plant is estimated to meet the requirements of the next three years.

After a brief discussion, it was agreed to seek Local Government Board sanction to the loan.

Details of the proposals are:

For extensions at the Bradford Road works	£702,100
Ditto, Droylsden works	9,000
Mains	40,000
Services	14,000
Meters	50,000
Cookers and fires	100,000

A statement of the capacity of the existing plant in relation to the present and prospective demand for gas shows that the total nominal manufacturing capacity of all the stations in 24 hours is:

Coal gas	24,500,000 c.ft.
Carburetted water gas	8,000,000 ,,
Blue water gas	1,000,000 ,,
Total	33,500,000 c.ft.

The largest quantity of gas manufactured in any day (24 hours) is 25,646,000 c.ft. The total nominal capacity has never been reached, as certain sections of the plant are always under repair. During the past three years it has not been possible to produce more than 24,000,000 c.ft. in any 24 hours, due partly to shortage of labour, but mostly to the inferior quality of the coal supply.

The proposed extension at Bradford Road is for the purpose of producing 8,000,000 c.ft. per day of 24 hours; and it is anticipated that this quantity will be reached in actual practice.

BIRMINGHAM CORPORATION GAS ACCOUNTS.

An Increase in Price.

The Birmingham City Council last Tuesday accepted the recommendation of the Gas Committee to increase the price of gas by 4d. per 1000 c.ft., and to reduce the quantity supplied through prepayment meters from 23 to 19 c.ft. for a penny. The Committee promised provisionally to give £20,000 from the profits as a contribution to the rates; but in view of heavy charges, they found themselves unable to do this.

Alderman J. H. LLOYD (the Chairman of the Works Sub-Committee), who submitted the report, pointed out that last July the Council sanctioned an increase in the price of gas of 4d. per 1000 c.ft., to meet the advance of 2s. 6d. per ton on the price of coal. At that time, he announced that conditions generally were so uncertain that it was impossible to forecast far ahead the financial position of the department. The effect of the Household Fuel and Lighting Order had been considerable; and there were other adverse conditions. Notwithstanding these, however, the financial results would have been on the right side, and the promised contribution to the relief of the rates could have been made, but for the action of the Government in reducing the market price of gas oil from 1s. 4d. to 8½d. per gallon. This meant that the whole of the stock of oil put down as a precautionary measure prior to the armistice had to be taken into stock on March 31 at the lower figure of 8½d. per gallon, instead of the purchase price of 1s. 4d.—a reduction in stock value of £40,000. The 4d. advance was estimated to produce a net revenue of £120,000 during the remaining nine months. To this might be added a saving of war charges estimated at £18,000; and if the same quantity of oil was used this year as in 1918-19, there would be a further saving of at least £40,000 due to the reduction in the market price. Heavy expenditure would be necessary in the next few years in connection with reconstruction work and renewals, in order to make up arrears. As to working expenses, everything would depend upon the action of the Government in connection with the continuance of the subsidy for the payment of the miners' recent increase, and the effect on output of the seven-hour working day. The policy of the Committee had been to supply gas at the cheapest possible rate; and it was for the Council to decide whether the price should be inflated in order to provide a greater contribution. The consumer was already badly hit by the proposed charges, though these still compared favourably with those made in other towns. The rather heavy reduction in the quantity of gas supplied for a penny through the slot meters was entirely due to the enormously increased cost of the maintenance of automatic meters,

cookers, and fittings. In the year just ended, the cost showed an approximate increase of 100 p.ct. as compared with 1914.

Considerable discussion took place; the Gas Committee being criticized with regard to the quality of the gas, and the proposal to reduce the quantity sold for a penny through prepayment meters. An amendment, to the effect that the reduction made in the amount of gas so supplied should not be more than equivalent to an increase of 4d. per 1000 c.ft., was lost by 43 votes to 41; and the resolution was carried.

The annual accounts of the department (showing that £23,012 had been transferred from the reserve fund to meet a deficiency on the profit and loss account) were next submitted by the Gas Committee.

Alderman LLOYD first referred in fitting terms to the resignation as Chairman of the Committee of Sir Hallewell Rogers. This resignation, he said, had occurred at a time of considerable difficulty; and Sir Hallewell's services and knowledge of the many ramifications of the department's activities would be greatly missed by the Committee. Up to the end of September last, the output of gas showed an increase of 4½ p.ct. compared with the same period of the previous year. The effect of the reduction of consumption in the following six months, however, turned this into a reduction of 4·8 p.ct. When the increase of 5s. per week in wages was granted by the Committee on Production, the Gas Committee considered the advisability of recommending the Council to increase the price of gas. But at that time the armistice was signed. It was expected that prices would fall; and in view of the probable return of men from the forces to the coal mines (which it was thought would give relief), no change was made. Those expectations were not realized; and instead of increased output, the situation was aggravated by strikes. During the year, they had had to use no less than 65,500 tons of Durham coal; the average delivered price being approximately 6s. per ton higher than that of their ordinary coals. It was also of a quality that reduced the capacity of the plant and increased the cost of production. The balance of profit on revenue account was £127,258, compared with £176,492 a year ago. Most of the items showed a considerable increase, due to the abnormal conditions. Wages had advanced by £107,024, compared with last year, equal to 2¾d. per 1000 c.ft. of gas made. Revenue from gas sold showed a gross increase of £146,000, due to the advance in price which operated from the June reading of the meters in 1918.

Carbonizing Plant at Windsor Street.

In connection with the carbonizing and other plant at the Windsor Street works, the Committee said that, in their report of March 5 last year, they mentioned the need for further reconstruction of carbonizing plant at the Windsor Street Gas-Works, and that negotiations were then proceeding with the Woodall-Duckham Vertical Retort Company, Ltd., for the erection of plant capable of producing 8¼ million c.ft. of gas a day. The necessary priority certificates, &c., were afterwards obtained from the Ministry of Munitions; and satisfactory arrangements were made with the Company for the erection of the plant. Unfortunately, the difficulties experienced last year in regard to both materials and labour delayed progress considerably; but the plant is now well on the way towards completion, and a portion (if not the whole) will be available for gas making next winter. A further small unit of vertical retorts is also being erected by the Woodall-Duckham Company at the coal-testing works. In connection with the extensions of plant at Windsor Street, a contract has been placed for the construction of a ferro-concrete crane gantry and coke-storage hoppers, at a cost of £15,877. The reconstruction of Nos. 3 and 4 carburetted water gas machines at Windsor Street must also be proceeded with. This, together with the provision of additional condensing plant, two tar-extractors, and waste-heat boilers, will entail a further expenditure of £21,637.

NOTTINGHAM GAS UNDERTAKING.

It was with a spirit of lively satisfaction that the Nottingham Corporation at their meeting, on Monday in last week, welcomed the allocation by the Gas Committee, in relief of the district rate, of £30,000, out of the profits of £95,000 made in the past year.

Alderman ALBERT BALL (the Chairman of the Committee) availed himself of the opportunity to reply to several ill-directed criticisms in regard to the undertaking, the management of which, in a period of abnormal difficulty, has been attended by conspicuous success. In moving the adoption of the report [*ante*, p. 641], he pointed out that there had been many trying conditions to be contended with during the past year. The Committee had done their best under very difficult conditions. Coal troubles had been again especially serious; while labour difficulties had had to be contended with throughout the period. The increase in the price of gas in Nottingham had been nothing compared with that in some towns of a similar nature. In the past year the Engineer and Manager (Mr. J. Wilkinson), and every official in the department, had done all they possibly could to maintain the efficiency of the undertaking. The collieries sent them what they liked, and charged what they liked. That was the position to-day; and he did not see how it could be improved, until the Coal Controller's powers were taken away, and they were allowed to get their supplies from the best and most convenient sources. The South Yorkshire pre-war rate for coal was 11s. 6d. per ton; but £1 6s. 6d. was the average price to-day. Notts and Derbyshire prices had gone up from 8s. 3d. per ton in 1912 to £1 3s. 1d. to-day. The Committee were perfectly satisfied with the management of the undertaking, being convinced that all who were concerned in the work had done their best.

Mr. H. GOVER FORD (the Vice-Chairman), who seconded the adoption of the report, said the department had not been able to spend anything like the money it should have done in keeping the works in

Gas and the Housing Problem.

PENDING the necessary provision of new houses, the best has to be made of existing accommodation. The essential economy of space is secured by the use of the ideal Cookers in present circumstances — Main's "Kent," "Sussex" and "Surrey." These efficient and compact cookers embody all recent improvements and are designed with a view to securing the minimum cost for maintenance.

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a proper state of repair. He desired to endorse all that had been said by the Chairman as to the excellent work which had been accomplished by the Engineer, who had dealt with difficulties in a very able way.

The SHERIFF (Mr. J. Morris) congratulated the Chairman of the Committee on the satisfactory report he had been enabled to present.

Mr. W. HALLS said he was pleased to hear from the Chairman of the Committee that, though the price of gas had had to be very considerably increased in Nottingham, it had not been raised to such a large extent as in the case of private companies. He thought that the policy in future should be to sell gas as near to cost price as possible, and not to take £95,000 of profits out of the consumers. At the same time, he recognized that there must be a surplus, if it was to be a successful undertaking.

The report was adopted.

LABOUR CO-PARTNERSHIP ASSOCIATION.

At the Annual Meeting of the Association, recently held in the Hoare Memorial Hall of the Church House, Great Smith Street, S.W., the chief of a goodly list of speakers were Lord Robert Cecil, M.P. (who occupied the chair), and the Right Hon. J. R. Clynes, M.P.

Lord ROBERT CECIL said they were in the presence of a great world-wide industrial crisis; and those connected with the Association might well think that if their advice had been taken earlier in the day, some of the more acute phases of this crisis would have been less menacing. At one time they had pressed strongly for the appointment of a Royal Commission; but no action was taken by the Government of the day. The matter was simple enough; there was no difficulty in understanding it. They were suffering from the wholesale destruction of capital during the war. He did not say this was the only thing; but it was certainly one of them. In his judgment, the only way to get back to a normal condition of affairs was by strenuous and united effort on the part of everyone concerned. Unfortunately, at this moment unity was difficult. There were very troublous times ahead; and they had to face a situation entirely new in their experience. How were they to face it? Could they hope to do so if they went on with the old organization of industry? He was perfectly sure they could not. There was nothing more certain than that within the next few years there would be a revolutionary change in industry. Generally speaking, at present the whole control of an industry was in the hands of the employer; the workers had no share in the management. Nationalization would not, of course, give any share in the control of industry to the workers. Nationalization meant State management; and State management meant management by officials. Whether it was a right or wrong policy, nationalization did not give self-determination to the workers, whereas co-partnership did. No doubt, there were difficulties in applying a system of co-partnership; but he was satisfied that the principle was sound, and that with the assistance of the energetic and experienced members of the Association they would be able to overcome whatever obstacles there might be. Everything was moving in their direction.

Mr. CLYNES said it would be admitted that most of the industrial troubles of the country could be traced, in one way or another, to differences regarding the sharing of profits. Judging from the schemes he had had an opportunity of examining, he regarded profit-sharing as a plan for extracting from the industries of the country the best that could be got out of them by combined effort. Employers were now more disposed than hitherto to take into account the human element; and with this better spirit, there should be much greater hope for the future in the matter of co-partnership and profit-sharing schemes. Of course, many corporation undertakings did not show a profit; and there were numerous other concerns which did not seem, under present conditions, to be suitable for profit-sharing; but there could be no reason why these limitations should deter them from inaugurating schemes to overcome difficulties wherever possible. He could not see why trade unions should longer assume an attitude either of hostility or suspicion towards co-partnership or profit-sharing schemes.

Mr. ANEURIN WILLIAMS, M.P. (Hon. Secretary), remarked that he had been engaged for nearly 27 years in this work of trying to make known what profit-sharing and co-partnership could do in the way of producing better relations and better results in industry; and others were in it before that. Therefore it was no new thing. Labour should have first of all a direct interest in the profit or the economy of its own work, and have wherever possible a stake in the capital employed, as well as a voice in controlling the conditions which go to make the greater part of a man's life.

Alderman F. WHITEHEAD, one of the representatives of the workmen on the Co-Partnership Committee of the South Metropolitan Gas Company, in seconding a vote of thanks to the Chairman (which had been proposed by Alderman Jabez Chaplin), remarked that so much had been said that afternoon as to the workmen taking part in the management of the business in which they were engaged, that perhaps it would be interesting to have just a brief outline of his Company's system of co-partnership. There was a Committee of sixty members, who represented the employees at the different works of the Company. When the women came along and took the places of the men who went to serve at the front, they were given representation according to the number of women employed; and the representatives of the women numbered twenty-two. Thus the women were given equal rights with the men ["Hear, hear"]; and they exercised these rights, and proved an asset to the Committee. The Committee met once a month, and evinced very keen interest in everything that took place for the Company's welfare and for the welfare of the men. Every facility was given by the Company to the Committee to carry on its work. He would give them one good example of what had been done. On Aug. 4, 1914, some of the men were called up; and it rested with the Committee to see what they could do. On Aug. 6, the Committee met

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and considered the matter, and made arrangements to pay the first week's money on the following Friday to the dependants of the men who had gone to fight their battles. Then they raised a fund, to which they asked those left behind to contribute; and he might say that from then to May 10 this year, no less a sum than £126,009 had been paid to the dependants of the men who had joined the Colours. [Applause.] This fund had been kept going by a Sub-Committee of the Co-Partnership Committee, ten in number, without the officials interfering in any direction—except that for every penny contributed by the men the Company gave another penny. The men had been asked to contribute even up to 1s. 9d. per week, which they did gladly. The Committee managed the fund just as they liked; and the scheme evolved had had the approval of everyone. After enumerating other points, he declared that it was only through co-partnership that the employees of the South Metropolitan Gas Company had been able to do what they had done; and it was for this reason that he had come to add his testimony to the soundness of the principles advocated by the Association.

CURRENT SALES OF GAS PRODUCTS.

Tar Products in the Provinces.

June 7.

The average values for gas-works products during the week were: Gas-works coal tar, 34s. 6d. to 39s. 6d. Pitch, East Coast, 56s. to 58s. 6d. per ton f.a.s.; West Coast—Manchester 48s. to 50s.; Liverpool, 48s. to 50s., Clyde, 55s. to 57s. 6d. nominal. Benzol 90 p.ct., North, 1s. 8d. to 1s. 10d.; crude, 65 p.ct., at 120° C., 11d. to 1s. naked at makers' works; 50-90 p.ct. naked, North, 1s. 9d. to 1s. 10d. Toluol, naked, North, 2s. to 2s. 1d. nominal. Coal tar crude naphtha in bulk, North, 7¾d. to 8¼d. Solvent naphtha, naked, North, 1s. 9d. to 1s. 11d. Heavy naphtha, North, 2s. 3d. to 2s. 5d. Creosote in bulk, North, liquid, 5d. to 5¼d.; salty, 4¼d. to 4¾d. Heavy oils, in bulk, North, 6d. to 6¼d. Carbolic acid, 60 p.ct., unsaleable. Naphthalene, £15 to £18; salts, £5 to £6, bags included. Anthracene "A" quality, 7¼d. to 7½d. per minimum 40 p.ct.; "B" quality, nominal.

FROM A MARKET CORRESPONDENT.

Tar Products.

There is still a steady business in tar products, although there has been a slackening off during the week end. Good export trade has diminished the accumulations of pitch; but it is extremely doubtful whether the movement can last much longer. The demand for road making and repairing purposes—which is now in full swing—should replace export business for a time, and makers, being well sold forward for next season, are very confident of higher quotations. Prepared tars are well sold, and an improvement in value is looked for here. Creosote and cresylic acid are practically without change, and carbolic acid remains hopeless. Solvent naphtha is neglected, and must continue so while the Government's stocks of mackintosh and rubber goods are so extensive. Crude and heavy naphtha are unchanged. Naphthalenes are still on the down-grade. Toluol is steady at last rates, and benzol continues to find an increasing demand, as it should do, in spite of the decrease in petrol prices. The National Benzol Association state that the price to users in 50-gallon drums is 2s. 8d. per gallon and in 2-gallon tins 2s. 9d. per gallon. This compares with 3s. 1d. for No. 1 petrol at most garages to-day. The Association add that at least 15 p.ct. more mileage can be obtained from benzol than from the best petrol; and therefore the equivalent price per gallon of benzol to petrol is 2s. 4d. per gallon. I drew particular attention to this feature concerning benzol three weeks ago. Other products are without change.

The range of home quotations is as follows:

Benzol: 90% London 2s. to 2s. 2d., North 1s. 11d. to 2s.; 50-90% 1s. 9d. to 2s. London, 1s. 9¼d. North; crude 60-65% 1s. 3½d. to 1s. 5½d.; pure, 3s. per gallon naked.

Carbolic Acid: Crude 60's unsaleable; crystals 40%, 4d. per lb. asked.

Crude Tar: London, 44s. to 46s.; Midlands, 40s. to 42s.; North 40s. per ton *ex* works.

Pitch: London, 67s. 6d. to 70s. per ton; East Coast, 54s. to 56s. per ton; West Coast, 46s. to 48s., with Manchester 47s. per ton and Glasgow 47s. 6d. per ton; South Wales, 56s. to 58s. per ton.

Solvent Naphtha: London, 2s. to 2s. 1d. Provinces average 2s. per gallon.

Crude Naphtha: Naked, 10d. per gallon.

Heavy Naphtha: 2s. 3d. per gallon.

Naphthalene: Refined, £15 to £17 10s. per ton nominal; crude, £3 10s. to £9, according to quality.

Toluol: Naked, 2s. 9d. per gallon nominal. North 2s. 7d.

Creosote: London, 7¾d.; North, 6¾d. to 7d.; heavy oil, 7¼d. per gallon in bulk.

Anthracene: 40-45%, 6d. to 8d. per unit per cwt.

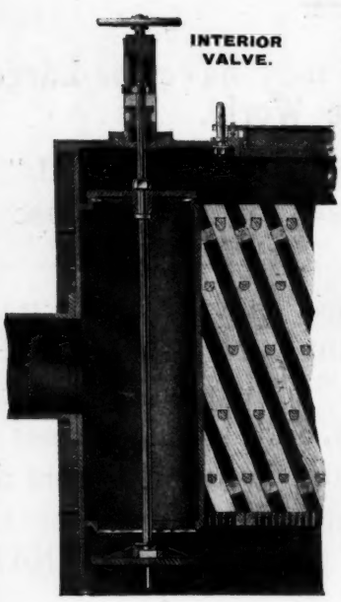
Grease Oils: 18° Tw. (naked), £6 10s. per ton f.o.r. makers' works.

Aniline Oil: 1s. 2d. per lb.

Cresylic Acid: 95%, 2s. 9d. to 2s. 10d.; 97-99%, 2s. 11d. to 3s. 3d. *ex* works London, f.o.b. other ports.

Sulphate of Ammonia.

It is early yet to attempt to gauge the effect of the removal of control. This gives us a little breathing space to consider the possible results of competition between sulphate and nitrate. The farmer has done very well with sulphate during the season now at an end; and he has not missed the large supplies of nitrate of soda which were available at reasonable prices—some £11 to £12 per ton—before the war. It will be some months before the farmer thinks of the Chilian fertilizer again; and in the meantime, shipments for agricultural instead of



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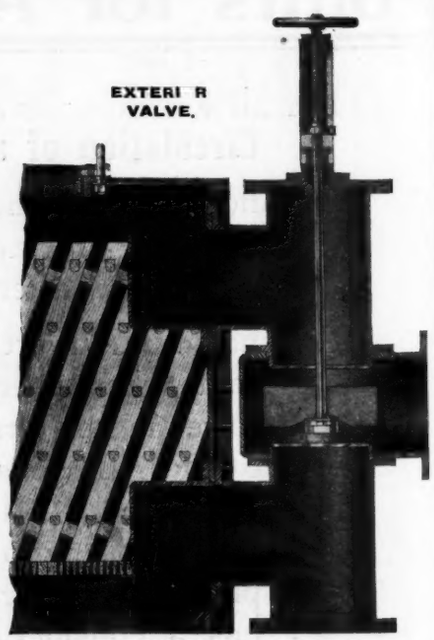

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MANCHESTER.

munition purposes will be resumed—thus restoring the competition between the two manures. Producers of both fertilizers plead high cost of production; but if the margin of profits on exports of sulphate—no longer controlled by the Government—is sufficient to enable the price to home consumers to be lowered, the position may still remain satisfactory. In any case, the battle between nitrate and sulphate will be interesting to watch, and the result will be of considerable importance to the future of the trade in sulphate, both at home and abroad.

Strike at the Blaina Gas-Works.—The employees of the Blaina and Brynmawr Gas Company went out on strike last Saturday week; and the district was practically without gas during the latter part of the evening. The dispute arose over the terms of the national award, which the employees contended were not carried out by a wages offer made by the Directors of the Company. The Secretary of the Municipal Employees' Association urged the men to return to work pending a conference; but they declined to do so.

Devizes Corporation Gas Department.—Mr. W. J. Rendell Baker, the Engineer, has submitted to the Corporation of Devizes his second annual report on the working of the Gas Department. He states that in the year to March 31 the quantity of gas made was 51,355,600 c.ft., as compared with 51,245,000 c.ft. during the previous year. With practically the same make, the sales increased by 4·5 p.ct.; unaccounted-for gas showing a decrease of just over this amount. After making the usual deductions, there is a net profit of £186, as compared with £1940 last year. Comparison of the various items in the revenue account more than explains the difference. The reduction in the price of gas in the form of extra discount alone amounts to £1178; while taxes have increased £564. The increase on materials used and wages is £267.

Fatality at the Poole Gas-Works.—The question of method of communication between employees was raised at an inquiry by the Borough Coroner into a fatality at the Poole works of the Bournemouth Gas Company. It concerned the death of a labourer, William Dunford, aged 20, who received fatal injuries by being caught between the wheel and the chain of a gravity bucket conveyor. The height of the building was given as from 60 to 80 ft.; the buckets on the endless chain coming in from the outside by means of a window, and then passing along a rail. Inside the building is a platform; but the conveyor is controlled by means of a clutch on the ground floor. A man on the platform desiring to communicate with the man controlling the clutch had to shout, or, if he was being observed, to signal. It was urged that there should be more effective means of communication than shouting. How the accident actually occurred remains a mystery, as Dunford, who was doing the work of another employee, was alone at the time. The Jury returned a verdict of "Accidental death;" and Lieut.-Col. H. W. Woodall (the Company's Engineer) expressed the deep regret felt at such a calamity.

Reinstatement of Demobilized Gas Workers.—The Gas Committee of the Salford Corporation have defined their policy for reinstating men returning from the forces. Those who entered the department after Aug. 8, 1914, will not be reinstated if there are no vacancies available in the department without discharging men who have not served in the war owing to age, medical category, or because they could not be spared, and who were in the service of the department before the date mentioned. Men who were in the service of the department before Aug. 8, 1914, are to be reinstated under the same conditions as would have obtained if there had been no war.

Tarred Roads and Fish.—The Joint Sub-Committee appointed by the Board of Agriculture and the Road Board to arrange for experiments to be carried out to ascertain whether there is any foundation for the allegation that tar-treated roads are a source of danger to fisheries (and what measures can be taken to minimize or obviate the possible danger), includes Mr. W. J. A. Butterfield, F.I.C., Consulting Analytical Chemist to the Road Board. In the meantime, the Road Board are urging highway authorities to exercise the greatest care in the execution of all surface tarring works. Refined tar and tar of a grade not lower than Road Board specification only should be used.

A Leeds Coal Concession.—At a meeting of the Leeds City Council, last Wednesday, Alderman W. Penrose-Green, in moving the adoption of the Gas Committee's minutes, said permission had now been received to use Yorkshire coal for the gas-works to the extent of 40,000 tons per annum, instead of the Durham coal which had had to be employed during the war, while the coal from their own neighbourhood went to the South Coast. This concession would mean a saving of 6s. per ton, or something like £12,000 a year. He, however, gave an emphatic "No," in answer to a question as to whether the price of gas will now be reduced; and Alderman Ratcliffe pointed out that coal which cost £147,000 in 1913 had cost £336,000 during the past twelve months. Wages in the same period had advanced 120 p.ct. These two items accounted for 1s. 2d. of the increase in the price of gas.

Bury Gas Undertaking and Restrictions on Gas.—In submitting a report to a meeting of the Bury Town Council last Thursday, on the working of the Corporation gas undertaking during the past year, Alderman Kay said there had been a loss of over £5600, which was largely due to the increased cost of materials and wages and to the reduced consumption of gas as a result of the restrictions that had been imposed. There had been 30 million c.ft. less gas used during the year; and this brought with it a big loss in revenue. The sooner they had all restrictions removed from the use of gas, the better it would be. Personally, he thought the Government had made a mistake in restricting it, as they had thereby lost a fine opportunity for educating the people in the use of gas instead of coal. He pointed out that coal now cost 24s. 6d. per ton, as compared with 12s. 6d. in 1913; wages paid in connection with the gas undertaking amounted to £28,270 last year, against £12,000; and rates and taxes amounted to £9650, compared with £6000 in the year preceding the commencement of the war.

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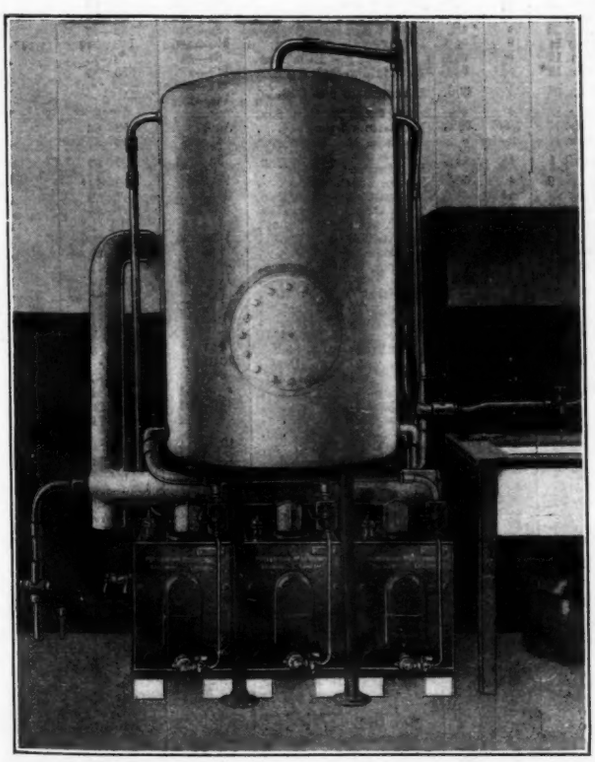

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Walsall Gas-Works Extension Scheme.—Mr. P. M. Crosthwaite, an Inspector of the Local Government Board, held an inquiry at Walsall last Tuesday respecting an application by the Town Council for permission to borrow £39,755 for the extension of plant at the gas-works. There was no opposition.

Irish Local Taxation.—The Irish Local Taxation Returns for 1917-18, just issued, show that municipal indebtedness for lighting amounted to £2,132,842, and that the net expenditure from revenue account was £8,947,366, or excluding the municipal gas, electric lighting, and tramway undertakings, £7,618,479.

Belfast Gas Prices.—The Belfast Corporation have adopted the Gas Committee's recommendation for an increase in the price of gas, as from the next commencing quarter, by 4d. per 1000 c.ft., making it 4s. 2d. for lighting, heating, and cooking—net price, less discount, 3s. 4d.; motive power, 3s. 9d.—net price, 3s.; high pressure, 4s. 4d.—net price, 3s. 5·6d. No change is made in the price of gas supplied through automatic meters. In the Cregagh district, the new price is 5s. per 1000 c.ft.—net price, less discount, 4s.

Newtownards Gas-Workers' Strike.—Owing to a strike of Newtownards Gas-Works employees, factories and firms in the town using gas for power had to close-down. The Ministry of Labour, Dublin, intervened with a view to a settlement.

Arbroath Gas Accounts.—At a recent meeting of the Arbroath Gas Committee, the report for the past year was submitted by the Manager (Mr. A. C. Young). There may be a deficit on next year's working of £2360; but Mr. Young holds that an increase in the price of gas might reduce the consumption, while there would be an increase of consumption and revenue if the price remained as now. This was agreed to by the Committee; and the price is continued at 2s. 11d. per 1000 c.ft. for ordinary meters and 3s. 4d. for prepayment consumers. The quantity of gas made during the year was 144,691,000 c.ft.—an increase of 14,627,900 c.ft. Cookers are given free; and the number in use is 5811. From residuals the revenue was £8470, an increase of £2338. The accounts for the year show a balance of £1860; and of this sum, £1000 is credited to contingency account. Out of revenue a sum of £500 has been provided towards the retorts renewal fund, which now stands at £2500.

STOCK MARKET REPORT.

As might be expected, business on the Stock Exchange last week was severely limited. Not only was the Whitsun break imminent, but the Feasts of the Derby and the Oaks claimed their devotees by thousands. Another more prosaic factor, it is said, was that a considerable section of the public were holding back their money for the New Loan this week.

Home Government suffered to some extent. The 5 p.ct. Loan held its own; but Consols were down with a closing mark of 53⅞, and most of the rest weakened. Home Rails were very quiet and dull. Canadians were fairish; but Argentines gave way.

In the Foreign Market, French had a further fall on the weakness of the Exchange; but Russians were still inquired for, and Danish were firm.

In the Miscellaneous Market, Rubbers were for the most part dull; but Oils rallied, and closed very steady. Shipping and Insurance concerns were in good request.

Business in the Gas Market was quieter, and would have presented a very poor array, but for the irrepressible twin attractions, Imperial Continental and Primitiva; and even they showed reduced activity. Far from weakening, they commanded rather better prices than in the week before. Imperial Continental was steadily dealt in every day at 145, which was about the middle price; and the closing quotation showed a rise of 2. Primitiva ordinary was firm, closing with a bargain at 40s. and a quotation better by ¼. The preference touched 70s.; but the quotation did not move. The Metropolitan Companies were not conspicuous; but Gas Light ordinary was a point easier. Suburban and Provincial were unchanged. Cape Town and Monte Video had advanced quotations.

Bargains done for cash during the week were as follows: On Monday, Bournemouth preference 9⅝, European 13, Gas Light ordinary 61, 61¼, 61⅜, ditto preference 72, ditto debenture 57, 57⅛, Imperial Continental 144½, 144¾, 145, 145⅛, 146, 146⅜, 147, ditto debenture 74, 74¼, Monte Video 13⅛, Primitiva 38s., 39s., ditto preference 66s. 3d., 68s. 9d., ditto debenture (1911) 50⅜, South African 13⅛, South Metropolitan 62½, ditto debenture 54⅜. On Tuesday, European 13¼, Gas Light ordinary 61, 61⅛, 61¼, 61⅜, ditto debenture 58, Imperial Continental 143⅛, 144, 144½, 145, 145⅛, 146, Monte Video 13⅛, 13⅜, 13½, Primitiva 37s. 6d., ditto preference 66s. 3d., ditto debenture (1911) 51⅛, South Metropolitan 61⅜, 62, 62⅛, Southampton 67¾, Wandsworth Epsom 70½, Danish 5 p.ct. preference 7⅛, 7⅜. On Wednesday, Gas Light ordinary 61, 61⅛, 61¼, 61⅛, ditto debenture 57½, 58, Imperial Continental 143, 143½, 145, 145⅛, Monte Video 13, 13⅛, Primitiva 38s., ditto preference 66s. 10½d., 70s., South Metropolitan 62, 62½, Harrow and Stanmore 5 p.ct. 79, 79½. On Thursday, Alliance and Dublin 56⅞, 57⅛, 57⅜, Cape Town preference 7⅛, European 13⅛, Gas Light ordinary 60¾, 61, Imperial Continental 143, 143⅛, 145, Monte Video 13⅛, 13⅜, Primitiva preference 67s. 6d., 68s. 9d., 69s. 6d., South Metropolitan 61⅛, Worthing 60, 60½. On Friday, Continental Union preference 70½, European 13⅜, Gas Light ordinary 60⅛, 60¾, 61, ditto maximum 55½, ditto preference 71, 72, Imperial Continental 143, 144, 144¼, 145, Metropolitan of Melbourne 94½, Primitiva 38s., 40s., ditto preference 67s. 6d., South Metropolitan 61, 61½, 62, ditto debenture 55.

In the Money Market, rates were at first variable; but after a while they settled down steady. The Bank rate is 5 p.ct., as fixed on April 5, 1917.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue. £	Share.	When ex-Dividend.	Ante-War Dividend & Bonus p.c.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
139,049	Stk.	Mar. 16	4	4%	Aldershot 4 p.c. Pref.	..	62—67	..
1,551,868	"	April 8	2½	2⅞	Alliance & Dublin Ord.	59—64	56—60	56⅞—57½
374,000	"	July 10	4	4%	Do. 4 p.c. Deb.	76—79	61—63	..
220,000	5	April 29	7½	8%	Bombay, Ltd.	5⅞—6⅛	6⅜—6½*	..
50,000	10	Feb. 26	15	12%	Bournemouth Gas and Water { 10 p.c. B ¶ p.c. Pref. 6 p.c. 4 p.c. Deb.	28—30	20—21	..
333,110	10	"	7	7%		15—15½	10¾—11½	..
115,000	10	"	6	6/-		13¾—14	9⅜—10	9⅝
159,740	—	"	—	4%		..	66—68	..
993,045	Stk.	Feb. 26	14	37/-	Brentford A Consolid.	261—266	74—77	..
784,920	"	"	11	31/8	Do. B New	204—209	68—71	..
55,000	"	"	5	5%	Do. 5 p.c. Pref.	109—111	78—83	..
221,400	"	June 11	4	4%	Do. 4 p.c. Deb.	91—93	65—67	..
214,775	"	Feb. 26	11	7½%	Brighton & Hove Orig.	205—210	137—142	..
244,300	"	"	8	5⅓%	Do. A Ord. Stk.	154—159	94—99	..
993,500	Stk.	—	5	5%	Bristol 5 p.c. max.	..	..	..
580,000	20	Mar. 26	13½	10%	British	44—45	30½—31½	..
190,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88—90	64—66	..
245,771	"	"	4	4%	Buenos Aires 4 p.c. Deb.	85—87	60—63	..
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1½—2½	5—5½	..
100,000	10	—	—	4½%	Do. 4½ p.c. Pref.	4—6	7⅜—8½	7⅛
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	62—67	..
187,150	"	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	..	..
1,518,280	"	Feb. 19	6/9/4	80/-	Commercial 4 p.c. Stk.	106—108	63—65	..
580,000	"	"	5½	26/3	Do. 3½ p.c. do.	103—105	58—61	..
475,000	"	June 11	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	51—53	..
800,000	"	"	4	—	Continental Union Ltd.	76—79	48—53	..
200,000	"	"	7	—	Do. 7 p.c. Pref.	115—118	70—75	70½
51,600	Stk.	Aug. 29	14½	12½%	Croydon A 10 p.c.	..	155—165	..
278,400	—	"	11½	9½%	Croydon B and C ¶ p.c.	..	130—135	..
492,370	Stk.	—	6	5½%	Derby Con. Stk.	128—135	..	..
55,000	"	—	4	4%	Do. Deb. Stk.	102—104	..	..
1,009,180	10	July 29	10	5/0	European, Ltd.	17½—18	12—14	13—13½
16,298,975	Stk.	Feb. 10	4/17/4	80/-	Gas { 4 p.c. Ord.	98—102	60—62	60½—61½
2,600,000	"	"	3½	26/8	Light { 3½ p.c. max.	76—79	55—57	55½
4,069,285	"	"	4	4%	and { 4 p.c. Con. Pref.	96—99	70—72	71—72
4,674,850	"	June 11	8	8%	Coke { 3 p.c. Con. Deb.	72½—74½	56—58	57—58
180,000	"	"	10	10%	10 p.c. Bonds	..	..	..
83,500	"	Mar. 12	5	4⅓%	Hastings & St. L. 5 p.c.	..	59—64	..
258,740	"	—	3½	2⅞%	Do. 3½ p.c	37—39	44—49	..
70,000	10	April 29	11	7%	Hongkong & China, Ltd.	16½—16¾	7—8	..
86,600	Stk.	Sept. 12	9	8½%	Hornsey ¶ p.c.	..	115—130	..
121,000	"	Mar. 12	7½	5⅓%	Ilford A and C.	151—154	90—95	..
65,780	"	"	6⅔	4⅔%	Do. B	115—118	69—74	..
66,500	"	June 26	4	4%	Do. 4 p.c. Deb.	92—94	62—65	..
4,940,000	"	May 14	9	4½%	Imperial Continental	150—160	142—147	143—147
1,326,000	"	Feb. 12	8½	8½%	Do. 3½ p.c. Deb. Red.	84—86	73—75	..
235,243	"	Mar. 12	6¾	6¾%	Lea Bridge Ord. 5 p.c.	119—121	90—95	..
2,498,905	"	Feb. 26	10	42/6	Liverpool 5 p.c. Ord. { A B	211—213 / 146—148	..	..
306,088	"	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	..	..
165,736	"	Feb. 17	7/5/6	82%	Maidstone 5 p.c.	..	58—63	..
75,000	5	June 11	5	5%	Malta & Mediterranean	4½—4¾	3½—3¾	..
250,000	100	April 1	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	98—101	90—97	94½
541,920	20	May 29	4	5%	Monte Video, Ltd.	11½—12	13—14*	13—13½
1,575,892	Stk.	July 29	4½	3½%	Newcastle&Gatsh'd Con.	98½—99½	67—69	..
539,705	"	June 26	3½	3½%	Do. 3½ p.c. Deb.	82—86	57—59	..
58,940	10	Feb. 26	7/14/0	7%	North Middlesex ¶ p.c.	14—15	9½—9⅝	..
800,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	101—104	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—8	4⅜—5½	..
66,000	50	Feb. 26	13	7½%	Portsea, Island B	128—131	76—81	..
100,000	50	"	12	6½%	Do. C	118—121	68—63	..
249,980	5	April 29	8	—	Primitiva Ord.	5½—6	1⅝—2½	37/6—40/-
499,960	5	June 26	5	—	Do. 5 p.c. Pref.	4⅞—5	3¼—3⅝	66/3—70/-
531,600	100	June 2	4	4%	Do. 4 p.c. Deb.	91—93	71—73*	..
600,000	Stk.	July 31	4	4%	Do. " " 1911	..	50—53	50½—51½
846,198	"	June 26	4	4%	River Plate 4 p.c. Deb.	85—87	50—53	..
150,000	10	May 14	6	6/-	San Paulo { 6 p.c. Pref.	10½—11	7½—8	..
125,000	50	July 1	5	5%	{ 5 p.c. Deb.	44—49	41—43	..
135,000	Stk.	Mar. 12	10	5%	Sheffield A	228—234	80—84	..
209,984	"	"	10	5%	Do. B	228—234	80—84	..
522,500	"	"	10	4⅔%	Do. C	220—223	71—74	..
183,201	Stk.	Sept. 12	4	4%	Shrewsbury 5 p.c.	..	..	..
90,000	10	May 28	9	10%	South African	10½—11½	12—14	13½
6,609,896	Stk.	Feb. 10	5/4/0	80/-	South Met. 4 p.c. Ord.	111—113	61—63	61—63½
250,000	"	July 12	—	5%	Do. Pref.	..	96—98	..
1,896,445	"	July 10	8	8%	Do. 3 p.c. Deb.	72½—74½	54—56	54½—55
224,220	"	Feb. 26	8½	5⅔%	South Shields Con. Stk.	154—159	99—101	..
262,795	"	"	6	3⅔%	S'th Suburb'n Ord. 5 p.c.	114—116	76—79	..
197,558	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	80—82	..
647,740	"	May 14	7½	5%	Southampton Ord.	99—102	67—69	67½
121,275	"	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	..	64—66	..
190,000	"	Feb. 19		4⅔%	Tottenham { A 5 p.c.	185—188	90—95	..
769,275	"	"	6	3%	District { B 3½ p.c.	115—117	65—67	..
181,265	"	June 26	4	4%	{ 4 p.c. Deb.	87—89	65—67	..
129,380	10	Dec. 30	6	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	..
226,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max.	103½—109	83—85	..
30,000	"	Feb. 26	3½	55/-	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	151—153	98—98	..
255,586	"	"	6½	40/-	Do. B 3½ p.c.	129—134	68—73	..
108,075	"	"	—	38/6	Do: C	..	68—73	..
140,865	"	"	—	38/6	New Ordinary	..	68—73	..
253,000	"	"	5½	35/9	Wimbledon 5 p.c.	117—122	63—73	..
98,000	"	"	6⅜	40/-	Epsom 5 p.c.	121—126	70—75	70½
88,416	"	June 26	3	3%	3 p.c. Deb. Stk.	86—89	60—62	..

* Ex Div.

Gas-Works Profit at Oldham.—The results of the past year's working of the Oldham Corporation gas-works show a gross profit of £40,105, and a net profit of £9809, of which £7500 is allocated to the relief of the rates.

Gas Supply to Luddenden Foot.—For a considerable time, the quantity and quality of the gas supplied by the Sowerby Bridge Council to the Luddenden Foot area has caused great dissatisfaction in the latter district; and complaints have been repeatedly made on the subject. The explanation given by Sowerby Bridge, that the causes are coal shortage and Government requirements, has not been accepted. Sowerby Bridge therefore have now come forward with an offer, having given the Council at Luddenden Foot the option of buying the works in their area. This has caused the liveliest interest in the districts concerned; and the next meeting of the Council, when the matter will be discussed, is awaited with interest.

The price of gas at Radcliffe, Whitefield, and Prestwich (Lancs) is to be advanced from 4s. to 4s. 3d. net per 1000 c.ft. There will be no change with regard to the penny-in-the-slot meters.

The fees payable to London County Council gas examiners under the present scale are 10s. and 10s. 6d. a day when undertaking tests; but the examiners have now asked for a reconsideration of these terms. The Public Control Committee therefore recommend an increase to 13s. per day, which increase will involve an estimated expenditure of £300 a year. This the London County Council have agreed to.

Mr. Geo. S. Frith, J.P., the Engineer and Manager of the Runcorn Gas Company, has recently been appointed Vice-Chairman of the Education Committee for the district. One of his first official duties was to present Gladys Bellfield, aged 6, with the certificate of the Liverpool Humane Society for saving another child from drowning. A big box of chocolates and a copy of "Alice in Wonderland," the gifts of Mr. Frith, went with the certificate.

The "Board of Trade Journal" draws attention to the fact that tenders are invited by the Controller, Cairo Tanzim Department, Ministry of Public Works, Cairo, for the supply of 1200 to 1500 tons of coal-gas tar for road works, and 100 tons of extra hard pitch, to be supplied within three months from date of order. Tenders close at noon on June 30. The general conditions on which tenders for Government contracts can be received, may be obtained from the Department concerned, or from the Government Press, Bulaq, Cairo, or from the Office of Sir Arthur Webb, K.C.M.G., Queen Anne's Chambers, Broadway, Westminster, S.W.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official List" for June 4.]

Nos. 13,142—13,872.

ANDERSON, J.—"Gas-controlling apparatus." No. 13,609.
BENNETT, T. H.—"Method of employing gas for heating, boilers, cooking, &c." No. 13,263.
BROOKS, H.—"Temperature-regulators." No. 13,343.
CAMPBELL, D. E.—"Process of making gas." No. 13,606.
CAMPBELL, D. E.—"Apparatus for making gas." No. 13,607.
CHRYSTAL, W. J.—"Recovery of ammonia." No. 13,816.
COPPEE COMPANY.—"Mechanical handling, screening, and loading of coke, &c." No. 13,188.
CORRIGALL, W. E.—"Gas-rings, &c." No. 13,337.
DESSEL, R. VAN.—"Acetylene gas-generating plant." No. 13,748.
Etablissements Poulenc Frères.—"Means for recording discharge or flow of gases." No. 13,291.
FAIRWEATHER, H. G. C.—"Gas-turbine plants." Nos. 13,570, 13,596.
GIBSON, J. W.—"Producing enriched water gas, and products and bye-products therefrom." No. 13,733.
HINTZE, J. G. W.—"Device for use with furnaces or flues for enabling condition of combustion to be ascertained." No. 13,636.
International Precipitation Company.—"Separating suspended material from gases." No. 13,336.
Koppers Company.—"Manufacture of ammonium sulphate." No. 13,757.
LAWSON, D.—"Stove burning solid fuel or gas." No. 13,537.
MELANO, C.—"Incandescent gas-burners." No. 13,370.
MILTON, H. M. N.—"Gas-producers." No. 13,225.
MITCHELL, E. A.—"Safety valves for gas-distribution systems, &c." No. 13,745.
MITCHELL, E. A.—"Valve for fluid-distribution systems." No. 13,866.
MOND, A.—See International. No. 13,336.
SIMMONDS, A.—"Hydraulic mains for collection of crude gas from gas-producing retorts" No. 13,178.
Svenska Turbinfabriks Aktiebolaget Ljungström.—See Fairweather. Nos. 13,570, 13,596.
THOMPSON, W. P.—See Etablissements. No. 13,291.
TOOTH, L. F.—"Gas-heated irons." No. 13,577.
WADE, H.—See Koppers. No. 13,757.
WRIGHT, C. A.—"Gas or solid-fuel cooking-stoves and heating apparatus." No. 13,522.
WYMAN, R. L.—See Gibson. No. 13,733.

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Applications, giving present Position, Qualifications, and Age, accompanied by not less than Three recent Testimonials, must be sent to the undersigned, marked "Assistant Manager," on or before the 24th inst.
Canvassing strictly forbidden.
B. W. SMITH,
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Gas-Works, Pleck,
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WANTED—Manager for Works. Make 10 Millions. House found.
Apply, by letter, stating Salary required, to No. 6675, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

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Apply, by letter, stating Experience, Age, and Salary required, to No. 6680, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

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WANTED, at once, Two or Three good District GAS-FITTERS. Single men preferred.
Apply, stating Age and Experience, to MANAGER, Gas-Works, REDCAR.

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THE Council are prepared to receive TENDERS for the following Plant.
CONTRACT No. 1.—EXHAUSTER HOUSE, BOILER CHIMNEY, and Sundry Plant FOUNDATIONS.
CONTRACT No. 2.—EXHAUSTER and STEAM-ENGINE.
CONTRACT No. 3.—WATER-TUBE CONDENSER.
CONTRACT No. 4.—CORNISH BOILER and SEATING.
The Drawings may be seen at the Gas-Works, and a copy of the Specifications and Bill of Quantities obtained at the office of the Engineer, Mr. Wm. Newbigging, 5, Norfolk Street, Manchester.
Sealed Tenders, to be endorsed in accordance with the instructions contained in such Specifications and addressed to the undersigned, to be received by him not later than noon on the 9th of June next.
JOHN NELSON,
Clerk to the Council.
Town Hall, Egremont,
May, 1919.

CORPORATION OF DUBLIN.

THE Public Lighting Committee of the Corporation of Dublin are prepared to receive TENDERS for the Supply of
(*a*) One 21 C.Ft. Standard TEST GASHOLDER.
(*b*) ,, 11 C.Ft. ditto.
Specifications may be obtained from the Official Inspector of Gas Meters, Tara Street, Dublin, on payment of £1 1s., which sum will be returned on receipt of a *bona fide* Tender.
Tenders, addressed "Chairman of the Public Lighting Committee, Lord Edward Street, Dublin, and marked "Tender for Gasholders," to be Delivered not later than 11 a.m. on Tuesday, June 17, 1919.
FRED. J. ALLAN,
Secretary.
Public Lighting Committee's Offices,
Lord Edward Street, Dublin,
June, 1919.

CITY OF MANCHESTER.

THE Electricity Committee of the Manchester Corporation invite TENDERS for the Supply of their Requirements of COKE or COKE BREEZE during Twelve Months ending June 30, 1920.
The Material offered may be Coke or Coke Breeze; but it should not be larger in size than 1 in. cube. The size preferred is not larger than ½ in. cube.
Forms of Tender may be obtained on Application (in writing only) to Mr. F. E. Hughes, Secretary, Electricity Department, Town Hall, Manchester.
Tenders, duly endorsed and addressed to the Chairman of the Electricity Committee, Town Hall, Manchester, must be sent in not later than 10 a.m. on Friday, the 20th of June, 1919.
THOMAS HUDSON
Town Clerk.
Town Hall, Manchester,
June 2, 1919.

NOTTINGHAM "PAN ASH," COKE BREEZE & COAL WASHER. HENRY WRIGHTSON & CO., LTD. SOLE MAKERS OF THE J. & J. DEMPSTER, LTD., MANCHESTER. ELSWICK CHAMBERS, BROADWAY, WESTMINSTER, S.W. 1.